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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Anzac.

Anzac Day, 25th April, was commemorated reverently and with rare inspirational intensity in every State capital and in every town and hamlet in the Commonwealth. As the years go on around the name of Anzac and around the name of the A.I.F. there is gathering a great tradition. The service and the sacrifice of the men, who during the years of dreadful crisis offered their gift of clean, vigorous life and happy youth on the altar of human liberty, will continue for all time as an inspiration to young Australians. Of the lessons of their sacrifice we were reminded simply, yet eloquently, by the Duke of York in this message to the Australian people:—

> It is a very great privilege to take part in to-day's ceremony to celebrate the landing in Gallipoli, twelve years ago, of the Australian and New Zealand Army Corps, which has made for ever famous the name of "Anzac."
>
> That great feat of arms, and the heroic deeds of all who shared in it, will be remembered so long as the Empire lasts. They gave their all for King and Empire, and their sacrifice will remain for ever a shining example of what human will and endurance can accomplish.
>
> A memorial to those whom we commemorate to-day has been raised on Gallipoli soil, for ever sacred to British hearts, but the best and worthiest memorial we can offer them is to seek inspiration from their example, to endeavour to learn the lessons they teach—of courage, patience, and self-sacrifice—and consecrate ourselves afresh to those great purposes for which they gave their lives.
>
> Therefore, I would beg of you to regard this day, not so much as one of mourning for the dead, but as one of earnest resolve on the part of us, the living, to emulate their example.
>
> Let it be our endeavour to live more worthily of those who made the last great sacrifice for us, and to do the utmost that lies in our power to maintain and hand down to the children who come after us those traditions of loyalty, fortitude, and devotion to duty which animated those gallant men, and on the preservation of which the whole welfare and security of the Empire depends.

Faculty of Agriculture.

One of the more important of recent events was the establishment of a Chair of Agriculture within the University of Queensland. Work has already commenced and students enrolled. Mr. J. K. Murray, Principal of the Gatton Agricultural High School and College is the first professor. He will combine the duties of the Faculty with those of his post at the College. The students will take in their first year course subjects similar to those required in the first year of the Science course, in addition to elementary work in engineering, drawing, and designing. Practical work will be done at the College at Gatton.

Fine Public Spirit.

The Queensland Chamber of Agricultural Societies has decided to grant a scholarship to students who take up successfully an agricultural or veterinary course at the Qneensland University. The sugar producers have made a similar grant. The Acting Premier, Mr. Forgan Smith, has commended warmly these practical expressions of lofty public spirit. They are examples, he said, that might well be followed by other public bodies.

The Duke of York and the University—The Importance of Education.

On the occasion of his receiving the degree of a doctorate of laws from the Vice-Chancellor of the University of Queensland, Dr. W. N. Robertson, the Duke of York said:—

> I thank you sincerely for the address with which you have just presented me, and the sentiments of loyalty which it contains, and I shall not fail to communicate them to His Majesty the King. I feel that I really should be addressing you in Latin on this occasion, but were I to attempt to do so I doubt if I should be intelligible to anyone.
>
> Although a University man myself, I must confess to having devoted my time to the study of economics rather than the classics, and so I will use my native language to express my deep gratitude for the very high honour you have paid me this afternoon in conferring a degree upon me.
>
> In these days, the importance of a good education is being increasingly realised throughout the world. It is the aim of modern parents to equip their children with sound knowledge and learning in order to fit them for the battle of life, and excellent as the training at school may be, my own opinion—and I speak from my own all-too-short experience—is that the boys and girls who are able to complete their education with a University career have gained an inestimable advantage which they will value more and more as time goes on.
>
> The Universities have an enormous responsibility. Not only are they training the minds, but they are also moulding the characters of a great portion of the nation's youth during the years when the younger generation is most susceptible to outside influences. It is upon that generation that the future prosperity and greatness of a country must depend, so it is no exaggeration to say that to a very large extent the destiny of Australia rests with her Universities.
>
> I have heard much of what you have done and what you are doing here. I know you are alive to your responsibilities, and that is why I deem it a very signal honour to have been made a member of the University of Queensland. I tender you once more my heartfelt thanks, and pray that your splendid work may reap the rich reward it deserves.

Education's Open Door in Queensland.

In the course of a notable address at the annual commemoration ceremonies of the Queensland University, the Chancellor, Hon. J. W. Blair (Chief Justice), had this to say of the educational opportunities for the young Queenslander:—"In those years the State scholarship system was placed on a qualifying basis, thus opening the doors to all young Queenslanders seeking higher instruction. Among other reforms the present system of extension scholarships leading to the Senior Public Examination was initiated. The present rural school scheme was another development of this period, which has since made satisfactory progress. For this advance, to Mr. J. D. Story and the staff of the Education Department Queenslanders will ever owe a deep debt of gratitude. . . . The influence of the University, however, does not end in Brisbane, in Queensland, or even in Australia. The problems of to-day are complex and manifold—some of them so difficult of solution as to call for the best brains, not only of the old land, but of the dominions beyond the seas.

"It is becoming more and more evident that to an increasingly large extent many vexed questions of the English-speaking races will be bound up with those of the South Pacific. The strategic positions occupied by Australia and New Zealand will make it necessary for the people of the Commonwealth and the Dominion to play a leading part in their solution. The handling of these matters cannot be left to chance; we must have highly trained and competent men to assist in their unravelling. For the training of such men the universities must, in a large measure, be responsible.

"Someone once said that for anyone with a capacity for knowledge to die ignorant is a tragedy. Is there any necessity for such a happening in Queensland? Here we have a co-ordination of educational institutions which enables the son or daughter of any citizen to attain to the highest position in the land, irrespective of wealth, creed, or social distinction. And here one might scotch the erroneous impression that a university is established solely to advantage the youth of the affluent. Such a view is not only unworthy but entirely without foundation. Rather is it a university's function to make discriminating search for talent and genius—in whatever walk of life they may exist—with the object of developing such gifts when discovered and thus transforming the possessors thereof into valuable national assets. And this search for and development of talent must proceed upon right lines in order to secure the best results. For to-day we have to admit, colloquially speaking, that there are many round pegs in square holes. It seems to be only the fortunate few who find work that is congenial. To many their daily occupation is burdensome or distasteful. Enormous loss to the State and disappointed lives result. All this surely can be avoided. Education is, after all, the leading forth or bringing up of the individual—the cultivating, guiding, developing, and disciplining of his or her powers, mental, moral, or physical, in order to prepare him or her for complete living."

Canberra.

May in Australia is a month of historic memories. Of the great events of the past one of the most important was the official founding of our federation and the opening of the National Parliament on 9th May, 1901. Just twenty-six years after, to the day, the coping stone is now being placed on the national edifice at Canberra, Australia's capital city. The first Commonwealth Parliament was opened by a Duke of York, the present King, and, fitly, another Duke of York, his son, will open the new Parliament House, a concrete symbol of the nation's unity, in Federal territory, again on the 9th of May. A Queensland poet, Brunton Stephens, with true prophetic vision, saw this day flashing its glory across the sun-flooded vista of Australia's future fifty years ago, and sung his song of golden prophecy, a forecast now fulfilled. In the twenty-six years of Australia's nationhood we have accomplished much and have endured much. We have witnessed the world changes of the most momentous quarter of a century of human history. In other lands we have seen the rise and fall of dynasties, and we have seen the welding of the British Commonwealth in common sacrifice and suffering. In our own land we have made remarkable progress. From east to west, from coast to coast, our widely separated communities have been linked by rail. Another transcontinental line from north to south is under construction, and in every State we have made immense material advances along every avenue of effort. In the years between, with the Motherland, we have had to fight for our liberty and national integrity. In the greatest test and contest of time Australian citizens gave proof of their courage and character at home and abroad. To those privileged to see and be with the men of the Australian Imperial Force, the world's only volunteer army, not on the outgoing transports with eyes alight with the spirit of adventure and eager service, not on the homecoming boats with eyes dimmed with poignant memories, but in the field in action could have nothing but faith in Australia's future. For the real capital of a country is the character of its people. That character was demonstrated on the ridges and in the gullies of Gallipoli, and was made further manifest on the heights of Pozieres, at Bullecourt, Messines, Paschendaele, and in Polygon Wood; and, during the last hundred days of fighting, from Hamel on to Mont St. Quentin and beyond, when Australian nationhood "forged on Thor's own anvil, and plunged in baths of hissing tears, grew tensile as steel." And so, when we reckon up our progress and assess the value of our harvests from the founding of our federation to the day when we arrive at complete national consciousness in the capital of the Commonwealth, the truth shines out, in all its bright significance, that, after all, Australia's greatest product is Men. In peace and war Australian manhood has been measured by world standards and has survived the test with honour. In the factors that count in human greatness, factors governed by character and competency, Australians have not suffered in comparison with other peoples. To-day, rising to the full height of their nationhood, conscious of their unity as symbolised at Canberra, inspired by the traditions of their race and the faith of their fathers, they step boldly out towards their national destiny.

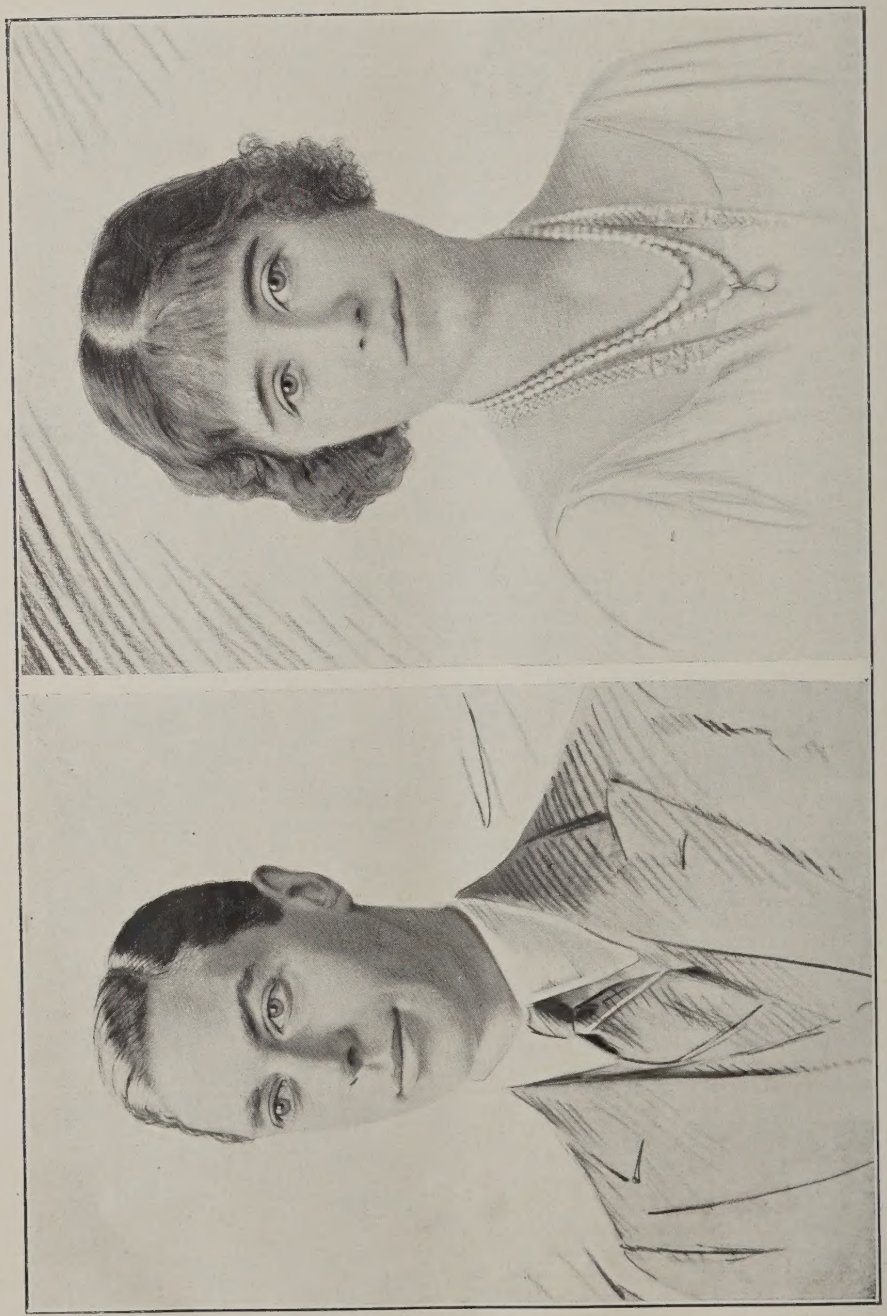

PLATE 91—THEIR ROYAL HIGHNESSES THE DUKE AND DUCHESS OF YORK.

THE ROYAL VISIT.

THE DUKE AND DUCHESS OF YORK WELCOMED TO QUEENSLAND.

TRIUMPHAL PROGRESS FROM THE BORDER TO THE CAPITAL—REMARKABLE DEMONSTRATIONS OF LOYAL ENTHUSIASM—TRIBUTES OF TRUE ALLEGIANCE AND WARM AFFECTION.

For a week of brilliant sunshine, days complete with all the glory of Queensland's wonderful autumn climate, their Royal Highnesses the Duke and Duchess of York were the honoured guests of the Government and the people of the State. Their stay with us, from 5th to 12th April, was marked by daily demonstrations of a spirit of true loyalty, unspoilt in its spontaneous expression in the natural, cheerful Australian way. Their journey from Wallangarra to Brisbane, across the Darling Downs, one of the most fertile provinces in the British Dominions, was a triumphal progress. After the bountiful rains of summer the country looked its best. Their Royal Highnesses were accompanied by General the Earl of Cavan, the Countess of Cavan, the Hon. Mrs. John Little-Gilmour, Lieutenant-Commander C. Buist, R.N., Major T. E. G. Nugent, M.C., Surgeon-Commander White, M.V.O., Mr. H. F. Batterbee, C.M.G., C.V.O., Mr. P. K. Hodgson, C.M.G., O.B.E., Major-General Sir C. B. B. White (Commonwealth Director), and Senator Sir T. W. Glasgow.

At the Border they were met by the Acting Premier, Hon. W. Forgan Smith, who did not deliver a long oration. He chose, rather, to sacrifice formality for the more intimate touch of an extempore speech, expressive of the simple pleasure of Queenslanders in greeting the son of their Sovereign. "To your Royal Highnesses," he said, "I extend, on behalf of the Government and people of this, the Queen State of the Commonwealth, a most cordial welcome. I trust that your stay will be a pleasant one, and that you will carry away happy recollections of Queensland and its people."

At every town and wayside station country people, including many Great War veterans of the A.I.F., gathered to join in the welcome. The people at each centre, in their fine physique, frankness and freedom, and obvious prosperity, symbolised the finest attributes of Australian citizenship.

In Brisbane, on the following day, every section of the citizens joined in a demonstration of loyal enthusiasm, which was remarkable for its spontaneity and happy naturalness. The flag-adorned streets in the processional route were lined with dense, good-humoured, well-dressed, cheering crowds. At night the city throbbed with life in a blaze of light and colour.

THE STATE RECEPTION.

ACTING PREMIER'S ADDRESS.

At the State reception to the Duke and Duchess of York on the evening of the 8th, the Acting Premier read the following address of welcome:—

May it please your Royal Highnesses:

On behalf of the Government and people of Queensland I desire to convey to your Royal Highnesses a most cordial welcome to this State, and to express our grateful appreciation of your visit.

It is a matter of considerable regret to the people of Queensland that, owing to the great distances over which you are called upon to travel, your Royal Highnesses will not have an opportunity of visiting the more remote parts of this vast State, especially the northern and western portions, where the residents are, in the face of many pioneering difficulties, developing in a truly wonderful manner our many and varied natural resources.

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 92.—ROYAL GROUP AT GOVERNMENT HOUSE, BRISBANE.

Seated (left to right).—THE COUNTESS OF CAVAN, MRS. FORGAN SMITH, THE DUCHESS OF YORK, MRS. W. LENNON, THE HON. MRS. J. LITTLE-GILMOUR.

Standing (left to right).—MR. H. F. BATTERBEE, C.M.G., C.V.O.; LT. COMMANDER BUIST, R.N.; MR. FORGAN SMITH, ACTING PREMIER; THE DUKE OF YORK; MR. W. LENNON, LIEUTENANT GOVERNOR; GENERAL THE EARL OF CAVAN, K.P., G.C.B.,

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 93.

Top.—THE ROYAL VISITORS ARRIVING AT THE CHILDREN'S DISPLAY, EXHIBITION GROUND, BRISBANE, FRIDAY, 8TH APRIL.

Officials for the day being presented by the Acting Premier (Mr. W. Forgan Smith). Grouped in the background are representatives of Australia's greatest asset—her bonny children.

Bottom.—THE ROYAL VISITORS, ATTENDED BY THE MINISTER FOR PUBLIC INSTRUCTION (MR. THOMAS WILSON—CENTRE) AND MRS. WILSON, VIEWING THE CHILDREN'S DISPLAY.

We have pleasant recollections of the earlier visit to Queensland of your kinsman, His Royal Highness, the Prince of Wales, and we trust that your sojourn amongst us, also, will leave feelings of mutual understanding and a keener appreciation of the close ties of relationship. We trust that you will, on your return to the Motherland, be graciously pleased to convey to His Majesty the King an expression of the true allegiance and warm affection which the people of this State bear to His Majesty.

Earnestly wishing your Royal Highnesses the fullest measure of health, peace, and happiness in the future, and a safe return home after your long and somewhat exacting tour of the British Dominions, I have the honour to subscribe myself.

Your most dutiful and faithful servant,

W. FORGAN SMITH,
Acting Premier.

8th April, 1927.

THE DUKE'S NOTABLE SPEECH.

"STATE BEFORE SELF."

In reply, the Duke of York said:—

On behalf of the Duchess and myself, I thank you sincerely for your Address, and for the cordial words with which, on behalf of the Government and people of Queensland, you have welcomed us to this great State. I shall take an early opportunity of conveying to the King, my father, that message of loyalty and warm affection which the Address contains.

To us, also, it is a matter of deep regret that in the limited time at our disposal we shall not be able to see for ourselves the more remote portions of the State, especially those northern and western districts where, as your Address recalls, the residents are, in the face of many pioneering difficulties, developing in a truly wonderful manner many of the natural resources. Though we cannot visit these portions of Queensland for ourselves, we wish to learn all that we can of the manner in which those vast distances of the West and the tropical regions of the North are being developed.

I congratulate you on the public spirit which distinguishes your citizens. It is right that you should be proud of your State; it is right that you should desire to make it the greatest State of the Commonwealth. And you can only show that pride, and realise that desire, by one and all working and toiling for it. "State before Self" is a motto that all who love their country should everywhere set before them.

We are glad to have this opportunity of meeting and talking to you. No one can travel as we have without being impressed with the vast distances which separate the various portions of the British Empire. The day may come, or rather we may say, is coming, when we shall be able to speak to one another freely across those vast distances of ocean, and when the King's own voice may be heard speaking to his subjects in all British lands. In the meantime, the best way of bridging the distances that divide us and drawing together closer the bonds of kinship, understanding, and sympathy which bind us together, is by visits to one another such as this.

The message I would bring to you is this: Let us try to learn from one another, to know one another better, to see how best we can help one another in our various troubles. It is the desire of all of us to produce the best conditions possible for all the country's workers, and it is of special interest to us in the Old Country to see how the younger nations overseas are tackling those social problems which are common to us all. In these questions and their solution I am keenly interested, and it is my desire to learn all that I can about them during my stay.

We all have our difficulties, and when we see the courage and enthusiasm with which the pioneers in this State and elsewhere in Australia have triumphed over the troubles which beset them, it is an inspiration to us at home to meet the troubles, different in kind, but equally urgent, which now beset us, in the same spirit of dogged British perseverance. The Old Country is not done yet, and in spite of all the dark clouds which now fill the sky, I am confident that there is in store a new period of prosperity which I pray may be shared by all the members of the British Commonwealth.

Once again we desire to express our gratitude for the generosity, the warmth, and the real affection with which we have everywhere been received on this our mission. We can never adequately thank you, but we shall remember it as long as we live.

From the day that our Royal visitors crossed the Border at Wallangarra until they returned to New South Wales through Coolangatta, they established a relationship with the people that was as natural and friendly as that which exists in any happy household. Their appearance in public was always a signal for cordial cheers that expressed the general popular goodwill towards the Royal family. There was not an occasion graced by the presence of the Duke and Duchess at which there was not a record crowd. On their journey across the Downs to Brisbane and from Brisbane to the Tweed, the Royal visitors saw not only some of the finest agricultural land in Australia, but also some representative pastoral holdings. At Beaudesert and Tamrookum they got glimpses of station life in our cattle lands as well. Nobody in a week could have seen more of Queensland than our Royal visitors did, though their comings and goings were confined to a comparatively very small portion of the South-eastern corner of the State, and certainly no one could have manifested greater interest in what was actually seen. Absence of official restraint and their informal mingling among the people added, if that were possible, to the immense popularity of the distinguished visitors.

On the eve of their departure from Queensland, the Duke of York, on behalf of the Duchess and himself, sent the following farewell message to the Lieutenant-Governor (Hon. W. Lennon):—

On leaving Queensland, after our all-too-short visit, I desire, on behalf of the Duchess and myself, to convey to you and to the Government and people of Queensland our most heartfelt thanks for the overwhelming kindness and generosity with which we have everywhere been received throughout our stay in this beautiful State.

The Duchess and I are most sincerely grateful to you personally and to Mrs. Lennon for your great hospitality and especially for placing Government House at out disposal. We are also under an obligation to you for the most enjoyable ball on Thursday evening. We would ask you to convey to Mr. Forgan Smith and his fellow Ministers our gratitude for the State reception which they gave for us, and all the many kindnesses we have received from them during our visit.

We are especially glad to have had an opportunity of seeing something of the industries of Queensland and also of Australian bush life and ways. Our only regret is that we had not longer to visit the more northern and western portions of the State.

It has given us much pleasure to see so many of your younger generation. We shall particularly remember the gathering at the Exhibition grounds, and the children's healthy and happy faces will remain one of the pleasantest memories of our visit.

All our lives we shall remember the enthusiasm and generosity of our reception in Queensland, and we wish the State and its people all possible prosperity and success in the future.

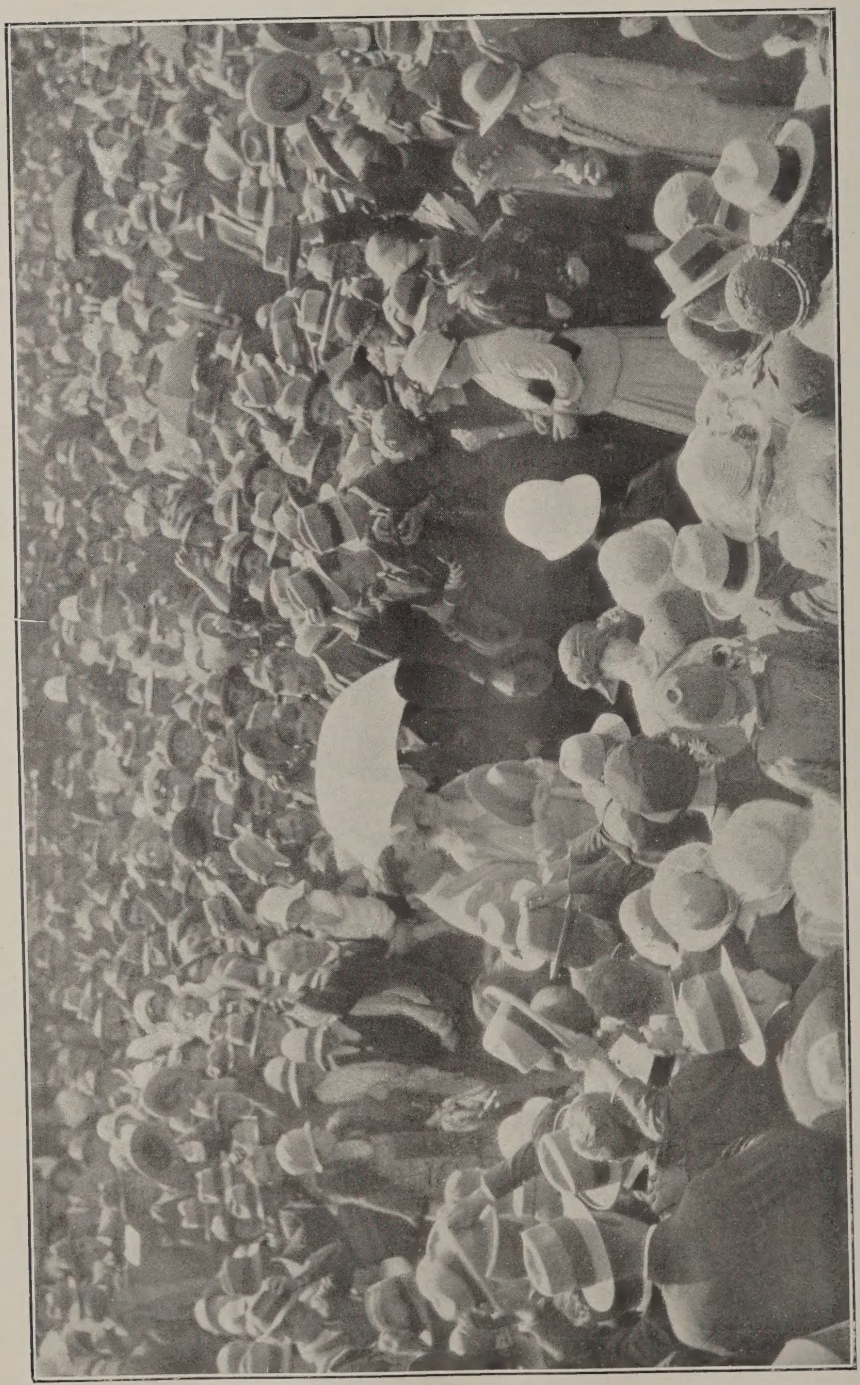

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 94.—THE DUKE AND DUCHESS MEET THE COUNTRY PEOPLE AT THE BEAUDESERT SHOW, 9TH APRIL, 1927.

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 95.

Top.—THE ROYAL VISITORS WATCHING CAMP DRAFTING, BEAUDESERT SHOW, 9TH APRIL.

The Judge of the Competition, Mr. S. Harding, explaining an interesting phase of life in the Queensland Cattle Country.

Bottom.—THE DUKE AND DUCHESS KEENLY INTERESTED IN RING EVENTS, WHICH ARE BEING EXPLAINED BY MR. E. T. BELL, M.L.A. MR. J. W. BLEAKLEY, CHIEF PROTECTOR OF ABORIGINES, IS ON THE LEFT.

Bureau of Sugar Experiment Stations.

FIJI DISEASE IN THE MARYBOROUGH DISTRICT.

By E. J. FERGUSON WOOD.

Extent.

See Map.

The disease is known to exist in the following areas in the county of March:—

(*a*) Walker's Point.—The finding of the disease here endangers the Island Plantation, and farmers in this latter area should be on the watch for the disease. The outbreak, however, is slight, and digging out of the infected stools as soon as infection is noted is the method recommended here. Make frequent inspections of your fields.

(*b*) Mungar Junction.—Another slight infection was noted here on one farm supplying Bauple mill. Efficient digging out of the infected stools will check the spread here.

(*c*) Welcome Creek, opposite Mungar.—A stool was found here, and the above recommendations apply here also.

(*d*) The Five-Mile, near Melrose.—Two stools were found here.

In all these occurrences the stools were in ratoon cane, which indicates secondary infection during growth.

(*e*) The main area.—Between the boundaries, from below Point Lookout along both banks of the Mary River to Lamington Bridge, and above the bridge on the northern side to a point beyond Croydon Junction. From Bidwell School along both banks of Tinana Creek to its junction with the Mary River. Several farms in this area are not at present infected, but must be regarded as in the infected area.

Suspected areas include:—

(1) Those farms within three-quarters of a mile of infected farms. This is an arbitrary distance;

(2) Those farms which are growing plants taken from infected farms.

The river is no barrier for Fiji disease infection.

No plants must on any account be taken from infected farms.

Causes.

The cause of the disease is at present a matter of conjecture.

Transmission.

The disease is transmitted:—

(*a*) In cuttings.—A heavy penalty will be incurred by anyone exchanging, buying, or selling plants from farms in the infected area without written permission of an inspector. Every cutting of a diseased stool, whether the latter appears diseased or not, will give rise to a diseased stool. Infection may not show up in a stool for months after it has taken place.

(*b*) By insects.—This method is thought to be a factor, and it is hoped to carry out some experiments aiming at proving this. Aphids (Aphis sp.) have been found on diseased plants in abundance, and the cane-leaf hopper, *Perkinsiella saccharicida*, is regarded as a possible vector.

(*c*) Experiments go to prove that infection is not carried in the soil.

(*d*) Not on cane knives as far as is known.

Rate of Spreading and Losses.

The following observations will give a general idea of the rate of spreading:—

(*a*) In a field of M. 1900 S., 2nd ratoon, 1926, about one-eighth of an acre in extent, only a few stools are making growth, and it is doubtful if any will reach maturity. Some stools did not ratoon; others are stunted, and nearly all are infected. In December last the 1st ratoon crop was reported 2 per cent. infected. The field was planted from an infected field without seed selection. (Figs. 1 and 2.)

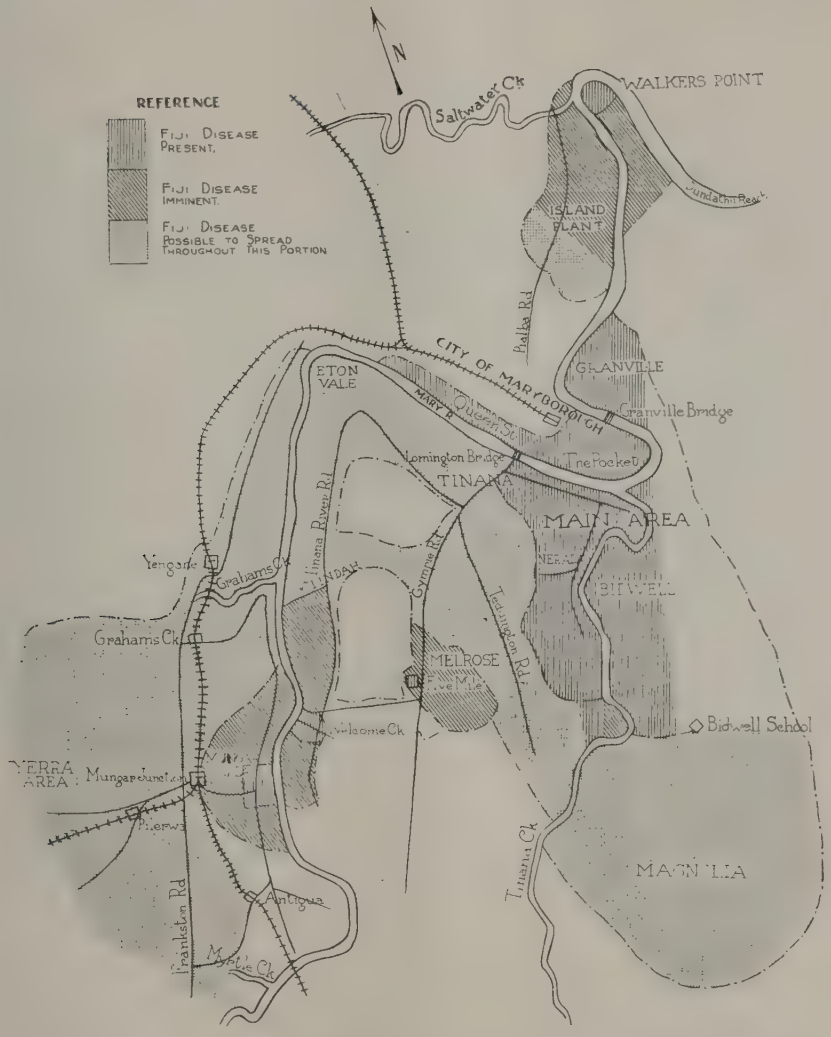

PLATE 96.—SKETCH MAP SHOWING THE INCIDENCE OF FIJI DISEASE IN THE MARYBOROUGH DISTRICT.

(*b*) A farm in Maryborough was visited in December last, and no disease was showing. Inspection at the end of January showed 1 per cent. infection in every field. The disease may have been latent in December.

In Fiji whole crops were destroyed by the disease, especially ratoons.

The disease is regarded by the Bureau as one of the most serious diseases of cane in Queensland. It is confined to the Beenleigh and Maryborough districts in Queensland, so far as is at present known. Therefore every step must be taken to prevent its spread.

PLATE 97 (Fig. 1).—FIELD OF M. 1900 S., 95 PER CENT. INFECTED WITH FIJI DISEASE.

Behind is Petite Senneville the same age. It can be seen by comparing the heights of the varieties that nearly all the M. 1900 S. is stunted due to the disease. Photo. taken at Maryborough by E. J. Ferguson Wood.

Effect on Plant.

(*a*) *Leaves.* (Figs. 3 and 4.)

(1) The leaves are as broad as usual, but about half their usual length;

(2) They are darker green than usual;

(3) They are twisted and deformed;

(4) They have small lumps or galls on the lower surface, running along the leaf from 1/32 to 1/16 of an inch in diameter by ⅛ to 1½ inches in length. They are light green or brown in colour.

(5) The leaves are bunched, and cabbage-like or fan-like. In the early stages the leaf galls are the only symptom, and these should be carefully looked for on plants surrounding obviously infected stools.

(b) The Stool.

(1) If infection is primary., *i.e.*, in the seed cane, the stool is rarely more than 18 inches in height.

(2) If infection is secondary, *i.e.*, due to infection of growing healthy plants by insect means, the stool usually ceases to grow, and shows leaf symptoms.

(3) Ratoons will, as a rule, either not come away or be stunted, as in the case of primary infection. Usually no cane is formed.

Galls similar to those in the leaves can be seen in the stem if closely looked for.

PLATE 98 (Fig. 2)—THREE ROWS OF DISEASED M. 1900 S. FROM THE SAME FIELD AS No. 1.

The comparatively healthy field is Petite Senneville. In comparing the resistance of the varieties it must be remembered that the M. 1900 S. seed is from diseased and the Petite Senneville from healthy seed. (E. J. F. Wood, photo.).

Regulations.

(1) Under the Diseases in Plants Act, no cane sets can be removed from any plantation to any other plantation. Anyone within the county of March who removes cane from a truck or vehicle conveying mill cane from another farm in order to use it as seed is liable to a heavy penalty under this Act.

(2) An inspector may, if he deems it necessary, compel any farmer to destroy diseased plants. This power enables the Department to protect the good farmer from the careless one. It should not be necessary, for clean farms are in the interest of both the individual and the community. Fiji disease can easily be fought if every man does his bit, and helps—

(*a*) Himself, by cleaning up his own farm;

(*b*) His neighbour, by urging him or lending a hand.

A diseased stool next door is as bad as twenty on your own farm, but you cannot ask your neighbour to clean up his place till you have done yours.

Control Measures Suggested for the Infected Farm.

1. Inform the Bureau of the infection if it is not already known. You may save yourself and your neighbours.

2. In cases of fields less than 5 per cent. infected, dig out all infected stools and keep this up at least once a month till the disease disappears. If all the farmers co-operate in this, the disease will soon vanish. One man can spoil a whole district by failing in this. A diseased stool is a constant source of infection.

3. Never plant from a diseased field, or, if possible, from a field adjacent thereto. Rather get the plants, with the permission of the Bureau, from a clean farm. Facilities for this are present in Maryborough, for Pialba is apparently clean, and

PLATE 99 (Fig. 3).—FIJI DISEASE IN D.1135. TWO STUNTED STOOLS IN A RATOON FIELD.

A large gall can be seen on the leaf in the extreme left foreground. Photo. taken at Beenleigh by E. J. F. Wood.

plants from a different type of soil are considered to be beneficial. Mr. Murray, care of Experiment Station, Bundaberg, will advise you in this matter.

4. Resistant varieties.—From the data at our disposal we conclude that certain varieties are more resistant than others to the disease.

D. 1135 and M. 1900 S. are the most susceptible. Those of which we have hopes as resistant varieties are Q. 813, H.Q. 285, and Petite Senneville. No definite conclusions can be drawn as yet, but in the meantime we strongly urge the planting of Q. 813, and suggest the trial of H.Q. 285 and Petite Senneville.

Q. 813 may be seen at Beenleigh growing healthily alongside infected D. 1135, which is showing secondary infection. Owing to this cane's marked resistance to other diseases, it is expected that its resistance to Fiji disease will prove good. Apart from this, it is a cane well suited to the alluvial soils of the Maryborough district,

having a high c.c.s., a good tonnage, good striking, and, if not cut too early, good ratooning qualities.

H.Q. 285 has not yet been sufficiently tested to show its resistance, but no Fiji has as yet been seen in it. It is an early-maturing cane, and a good ratooner with a high c.c.s. in the early part of the year. This is sufficient reason for its recommendation. It will not stand over.

Petite Senneville, which seems identical with Brown Innis, is a high c.c.s. cane, with good cropping and ratooning powers. What has been seen of this cane in disease areas gives indication of some powers of resistance.

Your cane crop is in danger.

Beat the disease before it beats you.

They did it in Fiji; you can do it here.

Plate 100 (Fig. 4).—A Typical Stunted Stool in Ratoon M. 1900 S.

The plants on either side are also infected. Behind is Petite Senneville. (E. J. F. Wood, Maryborough, photo.).

THE JOURNAL APPRECIATED IN THE NORTH.

Writing under date 26th April, 1927, a Northern reader expresses appreciation of the Journal in the following terms:—"Allow me to congratulate you on the fine standard maintained by the 'Queensland Agricultural Journal.' . . . . . Good illustrations are, I think a valuable aid if one would seek to make such publications popular amongst all classes interested in Agriculture."

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (26th March, 1927), from the Southern Assistant Entomologist, Mr. R. W. Mungomery:—

Soil Analyses in Reference to Grub Infestation.

From observations during the flighting period of *P. furfuracea*, the common cane-beetle of the Isis district, it has been almost definitely established that the beetles do not feed on any kind of foliage to promote subsequent development, but that, when the beetles emerge from the moist soil, the eggs of the females are in such a state of development that, after copulation has taken place, the eggs are soon ready for extrusion. This is at variance with the state of affairs which exists in regard to the greyback cane-beetle (*L. albohirtum*), which requires about a fortnight after its emergence before the first eggs are deposited. During the intervening time the females of the latter species feed from a large range of food plants, chief of which are members of the fig and eucalypt families, and it is generally recognised that the presence of these feeding trees in proximity to canefields has a decided influence on grub infestation in the surrounding cane crops. The general tendency in the North, therefore, has been either to get rid of feeding trees, or to have feeding trees in such a position that the beetles from them can be caught or otherwise effectively controlled.

Such a campaign of tree destruction instituted against the "furfuracea" beetle would result in so much waste of time, and with the point in view that these beetles are not in the habit of feeding on any of the scrub or forest trees, one would not expect any relationship to exist between the position of grub-infested land and the surrounding trees. This actually is in agreement with the area, which last year suffered grub damage in the Isis district, and affected parts being chiefly found in the centre of this large belt of cane land, whilst its outer confines, bordered by the forest, were not at all troubled with grub attack. Much the same may be said of the infestation of *P. furfuracea* in the Gin Gin district, where its grubs were found in the centre of the red volcanic areas on parts of the Watawa estate and surrounding farms; the grubs in the forest farms being those of *L. frenchi* or *L. trichosterna*.

One must therefore look for other causes to explain the occurrence of these pests in various parts of a district, and in soils of a comparatively uniform texture, colour, &c. It is found that there are definite lines of demarcation between the grubby areas and those not so infested. Thus the fact suggested itself that possibly there was some element or combination of elements present that made certain soils pre-eminently favourable for grub development, or, on the other hand, the presence or absence of such elements might exercise some prejudicial effect on the life of the grub. This conjecture has much to support it, for the presence of a good quantity of organic matter in the soil, brought about by ploughing in crops of green manure, has been the means of minimising grub damage in many places. Also, one often hears the opinion voiced by farmers that certain types of manures seem to bring about increased grub infestation, and others to lessen it, but nothing authentic can be said on this matter until further experiments have taken place.

The writer, accordingly, took samples of typical soils from the Isis district, three from grub-infested land and three from land free from grubs, and those have been analysed at the Brisbane Laboratory. It was hoped that from these analyses much data on the differences in the chemical constituents of each sample would be revealed, and with this to work on as a basis, it would provide a subject for future investigation. Results have, however, been of such a nature that no outstanding differences in the chemical compositions have been exposed whereby a connection could be established between the chemical composition and the presence or absence of grubs in any area under consideration. The analyses have, however, provided food for thought, and I have briefly summarised them as follows:—

——	Grubby areas.	Non-grubby areas.
Reaction	Very slight-very strong acidity	Very slight-medium acidity.
Nitrogen	Very fair	Very fair.
Humus	Fair-very fair	Very fair-good.
Available potash ..	Low-fair	Low-good.
Lime	Low-fair	Low-very fair.
Phosphoric acid ..	Low	Low.

From an inspection of the above table it will be seen that the noticeable differences existing in the respective groups are the somewhat lower humus and potash contents of the grubby areas in comparison with the other areas. The lower humus was not surprising, and it goes to confirm previous experimental work elsewhere in this direction, when growers were advised to adopt the slogan "Conserve the humus." Though undoubtedly humus conservation is an important factor, deficiency in this is not alone responsible for the appearance of grubs in certain blocks of cane, and fields of cane which previously have been heavily manured with green crops have since developed grubby patches, while the persistence of these patches from year to year has often been noticed. This is perhaps due to the "homing instinct" possessed by several beetles of this family, whereby the same fields are infested annually or biennially, according to the life cycle of the beetle under consideration, and in this connection "furfuracea" beetles have been known to lay their eggs in land that was fallow during the flighting season but which had previously been infested with grubs.

With reference to potash analyses, I have sometimes heard the opinion expressed that the application of either the sulphate or muriate of potash to grubby areas has been the means of getting rid of these pests; but, without exception, checks have not been kept by the growers. So it is impossible to state that the potash salts have been instrumental in freeing the land of grubs or whether other natural agencies have been at work. The results from the table certainly encourage this view, and it would be a good plan for growers to try a small experimental plot fertilised with potash on those lands which suffered losses through grubs in the past.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (*26th April*, 1927) *from the Assistant to Pathologist, Mr. E. J. F. Wood, for March-April, on the Isis district*:—

The two major cane diseases present in the Isis district are Mosaic and Gum. Mosaic is present probably on every farm, usually only to a very small extent. The average infection would be, I should say, well below 1 per cent., and frequently the number of infected stools on a farm can be counted on one hand. It is very gratifying to see farmers removing such stools as soon as they are pointed out. This happy state of things has been achieved in the main by careful seed selection and subsequent roguing with frequent inspections. North Isis is a splendid example of this, and varieties as highly susceptible as Black Innis (M. 147) are grown practically free from the disease. In this district, however, as in every other, there are one or two farmers who are not careful, and the result is a heavy infection of their own farm, and an increase in the infection of their neighbours.

It was noted on one farm that wild sorghum on public land was causing heavy Mosaic infection (over 50 per cent.) in cane, the plants of which had been selected, and which had been rogued since planting. Special efforts should be made to keep public lands, railway property, and tramlines clean, and the policy of the railways in letting their lands for cultivation is to be commended.

On account of Mosaic, I do not recommend the planting of M. 147 Black Innis, Striped Singapore, Rappoe, or Rappoe Seedling. Black Innis on one plantation has been rogued several times and is now over 50 per cent. infected.

I do not think that farmers need fear to plant E.K. 28, M. 55, or H.Q. 285 on account of Mosaic. These are of about the same order of susceptibility as M. 1900 Seedling, which is not seriously menaced. None of these canes have shown any signs of such virulent attacks as are usually seen in M. 147. At Dallarnil, Mosaic is very prevalent in Striped Singapore, Rappoe, or Rappoe Seedling, the three main varieties grown. A change of variety seems necessary here. I should suggest trials of Q. 813, Q. 1098, on the lower and E.K. 28 and Q. 1098 on the upper lands. H.Q. 285 appears to do well as an early maturing cane in this area.

Booyal has some Mosaic also, but on the farms visited it was not serious. Better control could be exercised to reduce it still more in some cases. Many farmers asked me if I believe that corn is a good rotation crop for cane? I do not, for the following reasons:—

1. It is well known that corn contracts Mosaic—diseased stools can be seen in nearly every field—and this Mosaic may be transferred again to the cane, as the insect vector returns to the cane when the corn is harvested or ploughed under. It is stated that the high percentage of Mosaic in Louisiana is due to the habitual growing of corn and cane adjoining each other.

2. Corn stalks contain a high percentage of silica which tends to prevent their rotting down after ploughing under.
3. Corn does not give the nitrogen to the soil that legume crops do.
4. Corn and cane are very closely allied, and we should expect them to utilise much the same plant food. The land is in no way rested in this manner, and it would be better to plant a legume crop or root crop.
5. Corn forms no sort of a cover crop, and half the advantage of a green crop—that of keeping the weeds down—is lost.

Gum does not seem prevalent this year, though some streaks have been observed, and in a few cases the yellow gum has been seen to ooze from the cut ends of samples. Some farmers are wisely planting Q. 813 in the lower infected areas. In other cases it is sufficient to choose only plants from high ground and to leave the plants for a day or two under a bag before planting. Then reject any sets showing gum. D. 1135 seems the most susceptible variety in this district and should be avoided where the disease is at all prevalent.

Of the minor diseases, Knife Cut is present to some extent in D. 1135 and M. 1900 Seedling. Peg Leg or Foot Rot occurs on many farms in M. 1900 Seedling. Both these diseases seem to vary in intensity with the seasons. Peg Leg is especially destructive. Lime and good tilth will often help to eradicate this disease.

Iliau is a disease of more importance, and is occurring on many farms at Childers, Cordalba, North Isis, Knockroe, and Hapsburg Plantation. It has also been seen at Booyal in D. 1135. The disease was first discovered in Queensland by Mr. W. Cottrell-Dormer, of the Bureau.

Symptoms.—Young plant cane up to 2 ft. in height is usually the subject of attack of the Iliau fungus (*Melanconium iliau*). Young ratoon has also been seen affected. The leaf sheaths are bound together by a white fungus mycelium so tightly that the growing tip cannot pierce the spindle of the young leaves, and so often doubles over on itself and may force itself out by piercing the leaf sheaths at the side, or die off. In the former case partial recovery may take place.

Black masses, about one-sixteenth of an inch in diameter, may often be seen on the lower leaf sheaths. These are the pustules of the fungus, and serve for identification. If in a field of young plant cane many dead shoots are seen, closer examination may serve to reveal the symptoms of Iliau.

Control.—Iliau is caused by a fungus, the spores of which live over in the soil from crop to crop. They are, however, killed by the sun, and good and frequent tilth, prior to planting, is recommended.

A peculiar trouble is occurring in the Isis district, which I have tentatively called "X" disease for the sake of convenience. I shall deal with this trouble in a separate paper, which will include a description of control experiments. No method of control has yet been devised.

Several leaf spots were thought to be causing damage here, and in isolated cases these may cause damage to fields through reduction of leaf surface, but usually they are comparatively harmless.

Another peculiar disease affecting M. 1900 Seedling was observed on one farm, and the farmer stated that it is spreading. The stalks of the standover cane are long and spindly, and the rind is striped red and white as though by Mosaic. The leaves are covered with short, yellow stripes, arranged in an indefinite pattern, recalling Mosaic. These leaf markings are distinct from the latter in appearance, and do not affect the youngest leaf. Roots are apparently healthy. Its origin is a mystery, and no other occurrence has been noticed in the Isis with the exception of a dead top of M. 1900 Seedling, which was shown to me by another farmer, and which might have been similar. The farmer concerned was unable to show me any living specimen, though he told me that it had caused him some loss of crop some years ago. Both these occurrences were at South Isis.

Regarding varieties, it seems to me that M. 55, Q. 1098, and E.K. 28 are coming canes for the higher lands, while H.Q. 285, as an early cropper, N.G. 16, and Badila seem to show promise on lower fields. M. 1900 Seedling and D. 1135 are the most widely-grown canes, while H. 109, Q. 813, H. 227, Pompey, Oramboo, Korpi, and Nanemo are worth a thorough trial. Q. 813 is especially recommended for low lands where gum is bad. It is not wise to plant too much of a new variety, or to discard it without a good trial. Plant new varieties at the edge of a field, when their ploughing out, if it be necessary, will be easy and will not spoil both the field and the farmer's temper, and so prejudice him against introducing varieties.

The Director of the Bureau of Sugar Experiment Stations has received the following report from Mr. G. Bates, Assistant Entomologist at Bundaberg, for the period March-April, 1927:—

The Sugar-Cane Moth Borer *(Phragmatiphila truncata,* Walk.*).*

This insect, which is to be found throughout the sugar areas, is, in most places in the Bundaberg district, purely of minor importance. Occasionally, however, it causes considerable damage, and calls for control measures. Dirty paddocks, more particularly in low-lying situations, and blocks adjacent to paddocks of Guinea and Natal grass are very subject to attack. This year, owing to the abnormal weather conditions, which prevented thorough cultivation, cane paddocks, especially in low-lying situations, became weedy and dirty, giving rise to ideal conditions for the breeding of this pest. It is to be found more or less throughout the district, and serious damage has been caused at Tantitha and South Kalkie. Standover cane appears to be a favourite breeding place, and in blocks of mixed varieties it is found that the softer canes suffer most damage.

The caterpillar of this moth is from 1 inch to 1½ inch in length, of a light purplish colour blotched indistinctly with dull white. The under surface of the body is dirty white, and the head light to dark red. It attacks both young and mature cane, and in the former case enters the shoot just above the ground, tunnels upwards, killing the growing point, and giving rise to what is known as "dead hearts." In big cane the borer is to be found in any part from the butt to the cabbage, where it tunnels about, sometimes causing the stick to break in two. Where cane is to be cut for plants this causes a lot of waste.

Fortunately, in this district the presence of a minute parasitic wasp, belonging to the family *Braconidæ*, generally keeps this pest in check. Borer larvæ have been collected from two farms several miles apart and were found to be heavily parasitised. This wasp is very small, measuring 2.5 mm. in length (approx. 3/32nd of an inch), and 4 mm. across the wings (approx. 5/32nd of an inch). It breeds rapidly, and it is interesting to note that one borer larva, parasitised under natural conditions, yielded ninety-four parasites, while another produced seventy-five. This wasp is easily bred under laboratory conditions and could be bred and liberated on farms where the parasite is not established.

One of the best means of controlling this pest is by clean cultivation. Headlands, &c., should be kept free of grass and weeds, and trash should not be left lying about but should be buried or burnt. It has been proved that this insect will breed in certain of the thick-stem grasses, so that these should be destroyed wherever possible. As mentioned before, this insect prefers the softer varieties of cane so that where it is particularly troublesome it might be advisable to plant harder varieties.

Aphis sp.

This insect is a minor pest of sugar-cane, usually more in evidence during the hot weather but still to be seen in one or two canefields. They are found on the under surface of the leaves, and being of a light green colour generally escape notice. They suck the plant juices and in dry weather are liable to check the growth of the plant. Their presence is often denoted by a sooty fungus which appears on the cane leaves, and many growers are under the impression that it is a disease. This is erroneous, as the fungus (*Capnodium* sp.) is a secondary thing and grows on the sticky juice secreted by the aphides while sucking the sap. These aphides are kept under control by several parasitic and predaceous enemies, and do not require any other control measures.

Grubs.

Owing to the fact that the three chief beetles attacking cane in the Bundaberg district—namely, *P. furfuracea, L. frenchi,* and *L. trichosterna*—have a life cycle that occupies at least two years, both large and small grubs of the same species, differing in age twelve months, can be found together in the soil at the present time. These smaller grubs, which are the result of eggs laid last flighting season, are now mostly in the second instar, and although not able to do any damage at the present time, will grow rapidly and be responsible for damage to cane next spring, so that growers are advised to collect grubs when ploughing, particularly the smaller ones.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (29th March, 1927) from the Entomologist at Meringa (Mr. E. Jarvis) for the period February to March, 1927:—

Field Experiments with Soil Fumigants.

During the past month advantage has been taken of the few brief spells of fine weather (rarely lasting longer than two to four days) in which to carry out field experiments against grubs of the greyback cane-beetle.

Fortunately the situation of our experiment plots on well-drained high land of volcanic origin permits of application to the soil of fumigants, such as napthalene, paradichlorobenzene, &c. (which are insoluble in water), a couple of days after the cessation of heavy rain. The various fumigants tested by us this season, up to the present, have been carbon bisulphide, chlorocide A. and B., "See Kay," paradichlor., carbosyl, calcium cyanide and "Kersinap."

An account of preliminary results obtained from some of these will probably be available for publication next month.

Notes on Parasite of Cane-Borer.

During the recent cyclone, on 9th February, the insectary building was blown from its blocks, but fortunately landed right side up, in such manner as to cause little damage to the numerous grubs being reared for purposes of study and experimental work.

Three large 6 to 7 feet square breeding-cages, however, situated close to the laboratory, and devoted to rearing specimens of *Ceromasia sphenophori*, the Tachinid Fly parasite of *Rhabdocnemis obscurus* Boisd., for distribution on canefields affected by this beetle borer, were greatly damaged, the netted sides and cloth tops of these cages being blown to tatters and scattered over the adjacent forest land. Two of the cages have been reconstructed, and the breeding of this useful parasitic insect is again progressing satisfactorily. The flood rains following this cyclonic disturbance also occasioned a certain amount of damage to young, late-planted cane by filling in the furrows above the deeply-planted sets before the shoots had attained a height of more than about 9 to 12 inches. The effect produced on the soil by the above-mentioned weather conditions was rather curious, the entire surface being left perfectly level throughout, like a table for smoothness; the rows of cane shoots looking as though they had been stuck into the uniformly flat ground.

Termites Attacking Cane Stools.

An instance of "white ant" infestation of sets and basal portions of the stools of cane plants occurred at the beginning of this month (March) at Freshwater, on a farm situated close to scrub land. Damage was, fortunately, confined to a few stools scattered over about an acre and a-half of ground, the shoots of which were observed to be wilted or dying off. The ground supporting this cane had been cleared of scrub timber last year, the crop in question consisting of first ratoons.

Such trouble can usually be avoided if care be taken when clearing the land to "run" all the big roots to a proper depth, and grub out old existing roots or stumps.

Specimens of this termite procured by Mr. A. N. Burns, Assistant Entomologist, proved upon examination at our laboratory to be examples of an undetermined species of a genus somewhat resembling *Microcerotermes*, one species of which is already known to damage cane sticks in the Mulgrave area.

Remedial action in such cases is best effected by digging out and burning all diseased stools, and then treating the holes with from 1 to 8 oz. of benzene or carbon bisulphide in order to kill any termites mixed among the soil particles. After applying such fumigants, the earth above should be wetted or pressed in such manner as to consolidate the surface soil to keep the fumes from escaping too readily during daily evaporation of moisture by the sun.

An Interesting Predaceous Larva.

While examining the foliage of young plant-cane last month (February) for leaf-eating insects, the writer was fortunate enough to find an egg cluster of one of our predaceous Asilidæ (Robber Flies) attached to a cane leaf. The eggs of such species of this family as have hitherto come under our notice up to the present have been practically hidden under a thin, greyish, crust-like layer, composed probably of some hardened secretion of coriaceous texture, under which the eggs themselves to the number of one to two hundred or more are closely packed together side by side lengthwise, at right angles to the surface of the leaf-blade.

These egg-masses are very irregular in form, and may vary in size from ¾-inch by ¼-inch to ½-inch by ⅜-inch, according to the number of eggs deposited.

When first hatched, the maggots, although only about three-sixteenths of an inch long, and no thicker than fine cotton, possess great powers of endurance, being found to remain alive in damp soil without animal nourishment for more than a fortnight.

During this interval, however, they increased noticeably in size, so that possibly, although predaceous in habits, these larvæ may be able to subsist for a time until meeting with some suitable host on organic matter in solution between the soil particles.

On 4th March, one of these maggots that had been placed in a breeding-cage was found attached to a small scarabæid grub near the head, having apparently been feeding for some days on its juices. This grub was nearly dead. Subsequently experimentation appears to indicate that after one of these predaceous larvæ has been attached to a grub for a few days the victim sickens and soon dies. The predator, however, is then able to subsist for a time in the soil until chancing to encounter another grub or soft-bodied subterranean insect.

Possibly our commonest species of Asilidæ attacking cane-grubs in the Cairns district is *Promachus doddi* Ric. This fly, which measures nearly 1¼ inch in length, is black, with buff-coloured hairs, which are longer and more numerous on the sides of its abdomen, ventral body surfaces, and pronotum. The wings are about three-fourths of an inch long, pale-yellow with reddish-brown nervures; while its stout, strong, dark-red legs have black tarsi (feet) terminating in two large claws.

The larvæ or maggots of this fly are sometimes found in furrows when ploughing, attached to the grubs of cane-beetles.

ENTOMOLOGIST'S HINTS FOR MAY, 1927.

By EDMUND JARVIS, Entomologist.

Select Good Seed-Cane.

During planting operations reject all seed showing tunnels of the weevil borer (*Rhabdocnemis obscurus* Boisd.) derived from localities known to be infested by this cane beetle.

Such sets often harbour its eggs or young larvæ, and a few weeks after planting same the latter may eat a sufficient amount of an affected set to endanger or lead to death of the young shoots later on, thus causing unsightly misses. Moreover, it is by the means of such infested seed that these weevil borers often obtain a footing in clean localities, and once this pest becomes well established it is not easily got rid of.

Apart from the danger of introducing insect pests, it is always advisable to use well-grown healthy cane for planting, and to make sure that it be free from serious fungus diseases.

When cutting sets, throw aside any showing signs of reddish or other discoloration at the cut ends.

Except Indications of Grub Attack.

During this month, especially if dry weather should be experienced, unmistakable signs of grub infestation will be noticed on those areas where the cane usually suffers, more or less severely, each season from the ravages of this pest. We hope that upon the first appearance of grub attack growers will at once communicate with the entomologist at Meringa Laboratory, in order that advice may be given as to what action should be taken in such cases, with a view to the prevention as far as possible of similar trouble next season, or to minimising losses likely to result from present infestations.

How to Combat Grasshoppers.

Indications, during the latter half of April, pointed to the liklihood of trouble being experienced this month (May) from attacks of *Locusta danica* and *Locusta australis*, the so-called "Yellow-winged Locust," and "Large Mottled Locust," respectively.

These insects strip the leaf blades, leaving only the mid-ribs; but, fortunately, the damage is confined to small areas, and if taken in time this pest can usually be successfully combated.

The following methods of poisoning grasshoppers are recommended:—A bait that has proved very useful is made from 100 lb. of coarse bran (the coarser the better), with 4 lb. of finely powdered crude arsenic or Paris green, 4 lb. of cheap grade granular dairy salt, 2 gallons of low grade molasses, 3 oz. of amyl acetate, with 10 to 12 U.S. gallons of water. If bran be not obtainable, sawdust might be substituted. When large amounts of this bait are being used the arsenic should be added to the liquid ingredients, instead of being mixed with the bran while dry. Spraying a strip of grass around or in front of an advancing swarm with 1 lb. of sodium arsenite, 4 lb. of treacle, and 16 gallons of water has also been advised, it being important that the poison and the treacle should be dissolved separately in hot water and mixed when cold. To treat 6 acres one needs 28 lb. of arsenite and 1 cwt. of treacle. Another capital poison-bait, recommended by an American entomologist, has been found a simple, effective, and exceedingly cheap remedy:—Sawdust 100 lb., sodium arsenite 1 quart, molasses (crude) 1 gallon, salt 5 lb., Water 7 to 10 gallons. Apply this at rate of 10 to 20 lb. of wet bait per acre (according to amount of grasshoppers present).

Tachinid Parasites now Ready.

Any canegrowers troubled with the weevil borer in cane-sticks are invited to apply to the entomologist at Meringa for parasites of this pest; which will be released by the Sugar Bureau free of cost on such affected areas.

FIELD REPORTS.

The Central Field Assistant, Mr. E. H. Osborn, reports (25th March, 1927):—

Proserpine.

The township and district are steadily increasing in importance. Much time was lost through wet weather. Rainfall: January, 17.44 in.; February, 10.55 in.; March, 0.85 to 4th; total 28.84 in.

As much country is low lying, and also retains the moisture for a long time, practically all cultivation work had been at a standstill since Christmas, with the result that weeds had invaded the fields.

Where "bedding up" had been carried out, the growth in very many cases is irregular, the outside rows of the beds (½-chain ones) looking very poor in many places. Water furrows and headland drains not being deep enough for so much water seem to be the principal cause of this. Probably the two-row beds system, so successfully used about Rosella and Homebush, with the water furrows kept well open would be of much benefit if carried out locally.

Throughout the district some good patches of plant cane were noticed, mainly August planted, but the cane planted later had suffered so much from dry weather that it was smothered with weeds when rain came. The ratoons, too, were only medium, all suffering from want of working, due to continuous wet spells.

Last year some 72,200 tons of cane, with an average c.c.s. of 13.3, were crushed, representing 1,060 samples taken, or one for every 7.2 tons of cane, while 375 growers supplied cane to the mill.

The following list of varieties, giving percentage of each, and average density, are of interest:—

Variety.	Per cent. Grown.	Average c.c.s.
H.Q. 426 (Clark's Seedling)	22.3	14.3
Q. 813	22.0	13.4
M. 1900	13.0	12.9
N.G. 15 (Badila)	19.4	13.4
Malagache	4.0	11.8
Mixed	8.7	13.7
D. 1135	1.6	12.2
Goru	3.6	12.8
Q. 1121	.81	13.6
Q. 116	.32	12.4
Q. 114	1.00	14.0
7 R 428 (Pompey)	.93	10.7
E.K. 28	.84	11.5
Striped Singapore	1.50	12.5
Total	100.00	

Varieties such as Striped Singapore, Malagache, D. 1135, Goru, &c., have steadily decreased in favour during, say, the past four years, whilst Q. 813, H.Q. 426, M. 1900, and N.G. 15 are far more popular; Badila (N.G. 15) having gone ahead by 10 per cent. This is accounted for to an extent by plantings in the new areas of Banana Pocket and Bloomsbury.

Fertilising.—Although not carried out to a very large extent, some growers are persisting with fertilisers.

Liming.—Some liming in the low-lying, heavier class of soil is being carried out.

Tractors.—Tractors have demonstrated their efficiency in the few fine days that the district has been favoured with since Christmas. All makes are being used.

Diseases.—Leaf Scald was noticed on a few stools of E.K. 1 plant at Preston.

Bowen.

Present indications are that this area will gradually go out of cane, and operations be confined to fruit and vegetable growing.

When visited, only small areas of cane were seen, showing fair growth, however.

The Southern Field Assistant, Mr. J. C. Murray, reports (28th March, 1927):—

Wallaville.

This district has made a good recovery from the dry weather which prevailed towards the end of last year. The cane is now growing rapidly, and, provided a fairly open winter prevails, there should be a crop of 20 tons per acre, on an average. Varieties doing well are M. 1900, H.Q. 285, D. 1135, Q. 813, and N.G. 22 (Mahona). H.Q. 285 and Q. 813, in the writer's opinion, are the best canes in this group.

Mosaic Disease is in evidence. As this disease is readily controllable, the growers should make a special effort to get rid of it. Take 1,000 acres on the Burnett River at the present time, embracing land from the top of Wallaville to the bottom end of Millbank, and the total loss per annum would work out as under:—

Varieties—D. 1135, M. 1900, Black Innis, Malagache.
Percentage of stools infected—50 per cent.
Loss in weight in twelve months' growth—30 per cent.
Assume a normal crop of 20 tons per acre—loss through Mosaic would be 3 tons per acre.
Assume a net price of 30s. per ton—loss per acre, £4 10s.
Loss per 1,000 acres—£4,500.

Other areas have been badly affected with Mosaic, but by working along lines laid down by the field staff, the disease has been practically wiped out.

Soils along the bank of the Burnett River at Wallaville are of an alluvial nature. This class of soil belongs to the transported soils group, and is one of the most important. Alluvial soils are rarely stoney, are usually level, fine grained, and very deep. Water usually leaves the soil it carries in more or less distinct layers; this "stratification" can often be seen in alluvial soils. Alluvial soils are mostly of very fine sand, silt, and clay. They vary greatly in chemical composition.

Growers in the Wallaville area are optimistic regarding their future; and they should be. They have a good mill in first-class condition, and, in spite of what some people think to the contrary, the bulk of the land in the mill area is good soil upon which excellent crops can be raised if reasonable rains occur.

Mullet Creek.

The cane observed here looks splendid. The varieties are B. 208, Q. 813, E.K. 28, D. 1135, and Black Innis. Very little disease was noticed, and the growers have no complaints to make regarding the depredations of grubs, &c. The countryside generally presented a fine aspect, with the tall forest trees and luxuriant undergrowth. Not far away is the mouth of Littabella Creek, famous for its good fishing. Owing to the good soil and many natural advantages, closer settlement will eventually come to all these places along the main North Coast line.

CHILDERS.

Great changes have occurred here since last visiting this district. Before Christmas there was every appearance of an absolute failure in the crop, now there is a splendid prospect of a good season. The heavy rain has, however, caused a great deal of soil loss through washing. Some farms will keep their owners busy filling up holes for some time to come.

The farmers, although their cane has responded readily to the heavy and well-distributed rains, do not want to overlook the fact that a great deal of fallowing and green manuring is required in this district. Although the crop this year may average 20 tons per acre, it would probably have been 30 tons if the soil had been kept free of root-destroying fungi by a system of fallowing.

The green cane that is to be seen now in the Childers area would go off if a drought came much more quickly than the cane would, say, in the new red forest soil in the environs of Bundaberg, where there is very little depletion of the root system by root rot. As stated there has been a great deal of the topsoil washed away in this area, thus it is essential that the farmer should know something of the nature of the subsoil.

The soil immediately beneath the richest part of the surface is called the subsoil. It may be of any depth, and extends to the underlying rock. The distinction between the soil and the subsoil, as the two names are commonly used, lies almost entirely in the colour and texture, due to the greater amount of humus near the surface. In cultivated Childers soil there is usually a more or less distinct line between the heavy red topsoil and the poorer or lighter coloured subsoil.

In nearly all cases the subsoil contains less available plant food than the soil above, because it is not affected as much by the weathering, being protected; and, because it is less affected by acids resulting from the decay of vegetation, since it contains less humus. The subsoil might be called rotting rock, and the soil rotted subsoil. This is an effective arrangement of nature. If the plant food in all the soil down to bedrock were as easy to lose as that in the first 9 inches of soil, our fields would soon become unproductive. The subsoil is a store of plant food that is held in reserve. We should look upon the rocks, stones, pebbles, and subsoil of our fields as so much potential plant food. It is being doled out from year to year as fast as can be used to advantage. The subsoil sets a limit to the depth at which certain soils can be ploughed. It may be yellow or of a different nature than the surface mould, and contains a large amount of raw plant food. If much of this raw soil is mixed with the surface soil the productivity of the land may be seriously reduced for a number of years.

Cane varieties that the growers here are advised to try more than they are doing are H.Q. 285, E.K. 28, and Q. 813. They are also recommended to try more local experiment in relation to fertilisers, and, generally, to take the initiative and assist and encourage experimental work in every possible way. There are growers in this area who have been planting D. 1135 and M. 1900 for years, and have not made the slightest attempt to systematically test new varieties. They have had them but have discarded them on a year's trial, or because someone else said they were valueless. It takes at least eight years to test a variety.

APPRECIATION OF THE JOURNAL.

A farmer on the Western Line writes (18th April, 1927):—"I am a reader of the 'Queensland Agricultural Journal' and I think it is a very fine book and all farmers should be subscribers to it. I would suggest that, if possible, you include an article each month on various breeds of dairy cattle on the same lines as your articles on pigs."

A Burnett farmer writes under date 24th March, 1927:—"We appreciate your Journal immensely."

RECORDS OF AUSTRALIAN THYSANOPTERA (THRIPS).

By A. A. GIRAULT, B.Sc., Entomological Branch.

When working up some material in this group the following records of distribution and hosts were gathered. Unless otherwise stated the localities are Queensland and the collector the author, while the insects were taken from the flowers unless stated to the contrary. The plants were kindly identified by Mr. C. T. White, Government Botanist.

1. *Thrips tabaci* Lindeman.—Supposed to be the common inhabitant of gardens and cultivated flowers but comparatively scarce. European. The following are new records:—From *Ageratum conyzoides*, November, 1925, Morningside, near Brisbane. *Loranthus longiflorus*, same place, October, 1925. *Buddleia madagascarensis*, same place; of these two were quite pale yellow with median line of abdomen dusky. Strawberry, Wellington Point, Tryon. On "silvered" melon leaves, Chinese garden, Coorparoo, 31st December, 1926. On *Mesembryanthemum equilaterale*, October, 1925, Brisbane River. Wild flowers, Gympie, July, 1924; also in October. The species has already been recorded as injuring onion foliage, and was taken from watermelon flowers at Raby Bay, 24th February, 1927. (See No. 35.)

2. *Thrips imaginis* Bagnall.—This is without doubt the commonest species in flowers and is native and widely distributed. It was described quite recently and had been confused with *tabaci*, which it closely resembles. The records of Victorian collections are by R. Kelly. Injuring grape blossoms, Amiens, Q., 2nd November, 1926, H. Jarvis; an asparagus, Gippsland, Vic., 22nd February, 1919; *Acacia decurrens*, Healesville, Vic., 26th November, 1925; *Verbena erinoides*, Roma, Q., 3rd December, 1925; *Xanthorrhœa minos*, Healesville, Vic., 28th October, 1926; *Helichrysum scopoides*, Healesville, Vic., 29th October, 1926; *Pultenea gunnii*, Healesville, Vic., 29th October, 1926; cultivated *Watsonia*, Malvern, Vic., 1st November, 1926; *Brioza minor*, Healesville, Vic., October, 1926. On elderberry flowers, Lilydale, Vic., 13th November, 1925; *Holcus lanatus*, Melbourne, Vic., 24th November, 1925; *Bursaria spinosa*, Yeringberg, Vic., 7th January, 1926; *Albizzia labbak*, Norman Park, Q., 5th December, 1926; jacaranda, Brisbane, 19th October, 1925; white clover in meadow, Norman Park, Q., 28th November, 1926; on strawberry, near Brisbane; columbine, Rochester, Victoria, 3rd November, 1925; *Acacia saligna*, Rochester, Vic., 3rd November, 1925, and *Leptospermum scoparium*, Yeringberg, Vic., 7th January, 1926; from roses, Melbourne, Vic., 24th December, 1926, G. F. Hill.

3. *Pseudanaphothrips achatus* Bagnall.—This is another common and widely distributed species. On tomato flowers, Wellington Point, Q., J. H. Smith, 22nd September, 1926; *Sonchus oleraceus*, Morningside, Q., 4th September, 1926; *Bakea virgata parvula*, Caboolture, Q., 14th December, 1925; wild flowers, forest, Gympie, July, 1924; forest, Bakers-

ville, Q., 15th March, 1919 (light specimen); flowers strawberry, Manly, Q., H. Tryon, 24th September, 1924; on same, Beerwah, Q., 9th October, 1920; lantana, Montville, Q., 16th December, 1925; *Glycine tabacina*, 9th November, 1925, Morningside, Q.; mango, same place, 7th September, 1926; also with No. 18 from peanut, and at the same time and place from *Verbena bonariensis* and *Sida Retusa*.

Nearly all the above specimens were blackish, the thorax sometimes reddish, the fore tibia and joint 3 of the antenna pale.

It has also been taken from *Mesembryanthemum equilaterale*, Brisbane, 25th October, 1925; *Duranta plumieri*, Morningside, 13th December, 1925; miscellaneous forest wild flowers, Gympie, 17th October, 1924 (thorax entirely black); *Verbena erinoides*, Roma, Q., 3rd December, 1925.

4. *Physothrips Kellyanus* Bagnall.—This is a large black-winged species of rather common occurrence, and the following data have been gathered in reference to it:—On flowers of orange, Botanic Gardens, Brisbane, J. A. Weddell, 27th September, 1924; *Cestrum parqui*, Brisbane, 27th November, 1926, I. W. Helmsing; *Duranta plumieri*, Morningside, 13th December, 1925; Gympie, Q.; lantana, Montville, Q., 16th December, 1925; cultivated lily, Brisbane, 19th October, 1925, W. A. T. Summerville; *Buddleia madagascarensis*, Morningside, Q., jacaranda, Brisbane, 19th October, 1925; orange, Mapleton, Q., 15th December, 1925; 26th January, 1926. Also with No. 5, on the *Murraya*. Some specimens are considerably lighter in colour than others.

5. *Physothrips mjöbergi* Karny.—On flowers of the orange, Mapleton, Q., 26th January, 1926. Also from miscellaneous flowers, place unknown; from jungle, Gympie, Q., 14th July, 1924; *Ricinus communis*, Brisbane, 17th February, 1927; *Murraya exotica*, same locality, a month later; a tree solanum, Brisbane, 6th April, 1927. Also lantana, Norman Park, 23rd March, 1927.

6. *Physothrips brevicornis* Bagnall.—Dugandan, Q., 20th May, 1923; flowers of *Sonchus oleraceus*, Morningside, Q., 4th September, 1926; West Melbourne, Victoria, 15th March, 1925, R. Kelly; *Hypochaeris radicata*, Lilydale, Victoria, 9th April, 1926, R. Kelly; also same host, Healesville, Victoria, 18th January, 1925, R. Kelly; *Hieracium*, Norman Park, 23rd February, 1927.

7. *Thrips lacteicorpus* Girault.—A moderately common species. Injuring flowers of grape, Amiens, Q., H. Jarvis, 2nd November, 1926; in blossoms of golden wattle, Morningside, 31st May, 1926; of the white bottle-brush ti-tree, same place, 18th October, 1925; *Clerodendron tomentosum*, amongst mangroves, Norman Park, Q., 21st November, 1926; *Albizzia labbak*, same locality, 5th December, 1926; tomato, Wellington Point, 22nd September, 1926, J. H. Simmonds; cultivated flowers, Morningside, Q., 1st November, 1925; *Acacia implexa*, Montville, Q., 16th December, 1925; white clover in meadow, Norman Park, 28th November, 1926; *Tristania suaveolens*, Morningside, 25th October, 1925; on foliage of fig, Sunnybank, Q., 21st April, 1925, H. Tryon; blossoms of *Leptospermum*, Morningside, Q., 4th and 11th November, 1925; *Jacksonia scoparia*, 13th October, 1925, same place; and mangrove, Norman Park, 7th November, 1926.

8. *Isononeurothrips australis* Bagnall.—Another common species. On *Loranthus longiflorus*, Morningside, 18th October, 1925; same locality,

4th October, 1925; forest, Wynnum, Q.; *Cocos plumosa*, 10th January, 1926; *Eucalyptus*, Melbourne, Vic., December, 1925, R. Kelly; on bottle-brush (white) flowers, Morningside, 18th October, 1925; *Syncarpia laurifolia*, December, 1925, and *Eucalyptus corynocalyx*, Melbourne, 24th November, 1925, R. Kelly; *Eucalyptus rostrata*, Sutherland's Creek, Anakie, Vic., 26th May, 1925, R. Kelly.

9. *Idolothrips marginatus* Haliday.—From this Department's collection (H. Tryon), a number of specimens labelled as having attacked leaves of choko, 15th November, 1916, at Sunnybank. This is the species heretofore known as *spectrum*. Also forest, Grandchester, 1st August, 1924.

10. *Idolothrips lacertina* Haliday.—In jungle at Gympie, 28th June, 1924; and at Mapleton.

11. *Desmothrips bagnalli* Karny.—In flowers *Cocos plumosa*, Morningside, 10th January, 1926; also in jungle, Montville, 12th September, 1923.

12. *Desmothrips tenuicornis* Bagnall.—Forest, Stanthorpe, Q., 24th April, 1924.

13. *Physothrips uniformis* Bagnall.—From flowers *Calotis cuneifolia*, Morningside, 23rd October, 1925.

14. *Thrips seminiveus* Girault.—From blossoms of rose and other cultivated flowers, Norman Park, 19th December, 1926 (with *T. imaginis*).

15. *Scirtothrips signipennis* Bagnall.—From miscellaneous flowers, Gympie, July, 1924.

16. *Cryptothrips dimidiatus* Hood.—Seems to be *Oedemothrips*. From miscellaneous flowers, forest, Gympie, 17th October, 1924. See No. 30.

17. *Adiaphorothrips semifuscipennis* Girault.—A male, forest, Rockhampton, 13th April, 1923.

18. *Physothrips cinctipennis* Bagnall.—Flowers white clover, Norman Park, 28th November, 1926; *Crotolaria striata*, same locality, February, 1927; peanut, Raby Bay, 24th February, 1927 (some of the females with legs, prothorax, also sides and undersurface of thorax and abdomen, light yellow); also with No. 5, from tree Solanum.

19. *Chirtothrips manicatus* (Haliday).—Brisbane, Department of Agriculture, associated with grain. European.

20. *Horistothrips ischnosoma* Karny.—A male, forest, Ipswich, July, 1919.

21. *Heliothrips hæmorrhoidalis* Bouché.—A cosmopolitan species. Curiously it has been taken in the jungle, Montville, 15th June, 1924, and a few more records are given herewith:—From *Rumex*, Healesville, Victoria, 18th January, 1925 (R. Kelly); jungle, Maleny, Q., 24th June, 1924.

22. *Isononeurothrips jenseni* Karny.—Several females from flowers of *Bidens pilosa*, Raby Bay, 24th February, 1927. This is likely an introduced species, as it was described from Sumatra.

23. *Neophysopus flavicinctus* Karny.—Another introduced species very likely but has been recorded already from Cape York Peninsula (Karny). A female was collected from the heads of the grass *Panicum crus-galli,* Raby Bay, 24th February, 1927.

24. *Stylothrips brevipalpus* Karny.—A female with No. 22 above. This is also an alien species, and was recently described from India. At Norman Park, 17th March, 1927, specimens were taken from the flowers of *Galinsoga parviflora* and *Amaranthus viridis* in a neglected garden, and see No. 35.

25. *Cryptothrips rhopaloides* Karny.—Two females, forest, Nambour, 31st October, 1923; a pair, forest, Gordonvale; femur 1 is swollen.

26. *Empresmothrips longfellowi* Girault.—From the forest, Beenleigh, 27th November, 1922; and Enoggera, 10th October, 1921.

27. *Horistothrips xanthocnemis* Karny.—Several males, jungle, Gympie, 28th June, 1924.

28. *Horistothrips australiæ* Morgan.—A male with No. 27.

29. *Horistothrips curviseta* Girault.—The mouth-cone is rounded, and this species belongs to the genus *Mesothrips.* The species was bred from galls on a forest tree at Taringa, J. H. Simmonds.

30. *Cryptothrips dimidiatus* Hood.—A macropterous form, sex unknown, forest, Gympie, 9th October, 1924. Like the other, wings dark brown, without interlocated fringes. The thorax and head were darkish, and the ocelli present and in a curved line upon the wide vertex; they are pale. The anal bristles are not elongate. The macropterous form is a typical *Cryptothrips.* The head is subquadrate, subequal prothorax. See No. 16.

31. *Neophysopus fragariæ* Girault.—Flowers of *Rumex,* Brisbane, W. A. T. Summerville, 22nd December, 1925; on foliage of strawberry, injuring it like red spider, Raby Bay, 30th March, 1927, J. H. Smith.

32. *Ceratothrips rufiventris* Girault.—This is a species of *Phibalothrips.* Forest, Manly, Q.

33. *Hydatothrips pocta* Girault.—Jungle, Cedar Creek, 3rd October, 1921. This species apparently represents a new genus near *Physothrips,* characterised by bearing one post-lateral bristle and a transverse head.

34. *Polyphemothrips brunneicorpus* Girault.—A male marked North Queensland. The antennæ here 8-jointed; 3–7 equal, 8 distinctly smallest, merely sutured from 7. The cheeks bear stout, moderately long setæ.

35. *Thrips shakespeari* Girault.—Originally described from jungle, and doubtless native; at Brisbane in an open city lot, it was found to be abundant upon the flowers of *Ricinus communis,* 17th February, 1927; and of *Tagetes glandulifera,* 12th April, 1927; in the latter case with species Nos. 1 and 24, No. 24 being most numerous.

36. *Adiaphorothrips io* Girault.—A specimen from *Polysporus* (part of plant not given), Darwin, N. Ter., 6th February, 1915, G. F. Hill.

37. *Frankliniella æschyli* Girault.—One female specimen from the flowers of lantana, Norman Park, 23rd March, 1927.

PROFESSOR J. K. MURRAY.

The first Professor of Agriculture at the Queensland University, Mr. J. K. Murray, was born thirty-eight years ago at Brighton, Victoria. He was educated in New South Wales—taking degrees in Agriculture (day) and Arts (evening), and a diploma in Military Science at the University of Sydney. During the great war Mr. Murray served overseas with the Australian Imperial Force. After the Armistice he took advantage of the excellent facilities provided by the A.I.F. Educational Service and studied at the Dairy School for Scotland, where he took the National Diploma in Dairying with first place in the final examinations. Mr. Murray came back to Australia through Canada and the United States, where he spent four months inquiring into agricultural educational methods, city milk supply systems, and the

Plate 101.—Professor J. K. Murray, B.Sc. (Agr.), B.A., N.D.D.
Principal of the Queensland Agricultural High School and College at Gatton, who is the first occupant of the Chair of Agriculture at the Queensland University.

manufacture of dairy produce. On his return he was stationed at the Hawkesbury Agricultural College (N.S.W.) as Lecturer in Bacteriology. While there he conducted research work on the relationship of micro-organisms to cheese made from pasteurised milk, and the numbers of micro-organisms and H-ion reaction in raw creams.

In 1923 Mr. Murray was appointed Principal of the Queensland Agricultural High School and College. In 1924 he married Miss Evelyn Andrews, a graduate of Sydney University in Agricultural Science. As chief of the College at Gatton Mr. Murray's work is well known and appreciated by all interested in the development and progress of agriculture in Queensland.

RETIREMENT OF MR. BENSON.

DEPARTMENTAL VALEDICTORY.

Mr. A. H. Benson, Director of Fruit Culture, retired from official life on 31st March, and the occasion was marked by a large gathering of fellow officers, representative of every branch of the Department. On their behalf he was presented with a well-filled wallet by the Under Secretary, Mr. E. Graham, as a mark of his thirty years association with the service. In the course of a valedictory address Mr. Graham referred to Mr. Benson's connection with the land since he was dux of the Royal Agricultural College, Cirencester, in 1879, until he joined the Queensland Service in 1896, after working in California and New South Wales; and added that Mr. Benson left the Department with the good wishes and respect of the Minister and every one of his fellow officers.

Mr. Benson expressed his pleasure at the good feeling that had always existed between him and his brother officers. He said that it was by no means his intention to become dissociated from the fruit industry, as he had arranged to enter banana-growing on the North Coast immediately.

Mr. Albert H. Benson, M.R.A.C., is the only son of the late Joseph Benson, a pioneer Queensland squatter in the Burnett district during the fifty's. Mr. Benson was born near Taunton, in Somersetshire, England, on his father's estate, and was educated at Taunton College, and the Royal Agricultural College, Cirencester, of which he is a member and gold medalist. He has been connected with agriculture during the whole of his life, and is a recognised authority on fruit culture. Shortly after he was twenty-one Mr. Benson was given the management of an agricultural estate in East Lothian, Haddingtonshire, Scotland, a county noted for its good farming. There he gained experience in growing various farm crops, and breeding and fattening sheep and cattle, as well as raising fat lambs for the English market. He occupied this position for five years, when his employer having accepted the Governorship of Madras, decided to let all the farms that had been under his management. Having heard a very glowing account of the prospects for successful culture of fruit in California, Mr. Benson decided to go to that country, where he remained five years, and gained practical experience in all branches of the fruit industry, as well as a general insight into American methods of agricultural investigation and experiment station work; besides taking a course of training at the University of California.

Mr. Benson left California for Sydney early in 1892, and was offered the position of fruit expert to the New South Wales Department of Agriculture, and was the first person in the Commonwealth to be given this title. Although appointed fruit expert, his work was not confined solely to fruit matters, but the knowledge he had gained of American agricultural and horticultural experiment work was made use of during the establishment of the Wagga, Bathurst, Pera Bore, and Wollonbar experiment farms. The value of his work was appreciated very highly by the then Premier of the Mother State (the late Right Hon. Sir George Reid) and Minister for Agriculture (Mr. Sydney Smith).

In 1896 Mr. Benson was offered the position of instructor in fruit culture for Queensland, by the late Mr. A. J. Thynne, then Minister for Agriculture. His services in this State also were not confined to the fruit industry, but included general agriculture as well. Much of his instruction in fruit culture was of a practical nature, given in the orchard itself, and included cultivation, manuring, pruning, pest destruction, and handling and packing fruit for market.

Early in 1908 Mr. Benson was sent to England as a representative of his department at the Franco-British Exhibition, and was absent for twelve months. On his return he visited Ceylon and the Federated Malay States to obtain information in connection with tropical agriculture, and pineapple canning in particular. He resumed his duties as instructor in fruit culture early in 1909, but resigned his position at the end of March, 1910, to take up that of Director of Agriculture in Tasmania. Here his early training proved of great value, as his duties necessitated having a good general knowledge of agriculture, stock, and fruitgrowing.

In 1915 Mr. Benson returned to Queensland as Director of Fruit Culture, which position he held until his retirement.

PLATE 102.—A. H. BENSON, M.R.A.C., DIRECTOR OF FRUIT CULTURE, DEPARTMENT OF AGRICULTURE AND STOCK, WHO RETIRED UNDER THE AGE LIMIT ON THE 31ST MARCH.

DRY SEASON SAFEGUARDS FOR THE GRAZIER.

N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

Experience of the seasons, since the beginning of land settlement in Queensland, shows that periods of more or less acute shortage of pasturage recur at irregular but frequent intervals. A review of the past forty years will reveal long dry periods, fodder shortage, and great losses of stock over the greater part, if not the whole, of the State in the years 1888, 1902, 1915, 1919, 1923, with probably the worst experience in 1926. While these years were notable as affecting the greater part of the State, different districts experienced bad seasons in one or more of the intervening years.

Losses of stock are not only disastrous to the owners, but to the State as a whole, for the prosperity of the one is reflected in the other.

The actual loss to the pastoralist cannot be set down as merely what it would cost to replace the animals that perished, even if, where careful breeding has been practised for years, animals of equal quality could be secured. To this amount must be added the cost of purchased fodder landed on the holding, the extra cost of attention in hand feeding, or the cost of transport by rail, by droving, or both, to and from the relief country, the cost of such country, attention there, and the loss of income during the period. These and other points discussed by Mr. Pollock in the following pages will command the attention of every stockowner and farmer among our readers.

The loss to the State in any period of prolonged drought is generally looked upon as being that shown in the lower collection of income tax, but a little reflection will show many other directions in which revenue will be adversely affected, while the community as a whole will also, in greater or less degree, feel the absence of the circulation of that larger amount of capital created when the season is good. The economic loss, due to the disastrous season of 1926, in the woolgrowing industry has been set down by a gentleman intimately connected with the business side of that industry as in the vicinity of £12,000,000, a figure which many well versed in the ramifications of finance hold to be a reasonable estimate.

When to this amount is added that which could be estimated in the other industries affected, some idea of the national character of the calamity can be gained.

Looking Ahead.

With the certainty of the recurrence of bad seasons in future years, ways and means of providing against future visitations merit serious consideration.

Obviously, the safeguard against loss of stock from starvation or disease engendered by a lack of nourishment in a dry season must be looked for in a scheme to provide the necessary nutrition. In this direction, three schemes may be considered—

1. Relief country and transport thereto.
2. A stored supply of fodder, such as hay, grain, &c., in dumps at one or more centres on the railway.
3. Growth and conservation of fodder on the holding.

Relief Country.—Advocates are not wanting for the construction of the one-time proposed Great Western Railway from Camooweal in a southerly direction through the West of Bourke, in New South Wales, and the extension of our present lines to connect therewith, to allow of the transport of sheep to relief country. When consideration is given to the progress of land settlement which this proposed railway would tend to accelerate, the area of country available for relief could be expected to become less and less as the years went on. The experience in 1926 with sheep on the east coast, the Gulf, and the Atherton Tableland, though satisfactory in individual

instances, cannot be considered to have been profitable on the whole. These latter lands, as time goes on and settlement progresses, can also be expected to decrease in available area. In consequence, dependence on relief country as a safeguard against abnormally dry seasons in the future does not appear feasible.

FODDER CROPS.

Storage of Fodder as Hay or Grain at Central Points.—Some consideration was given in 1923 by the Council of Agriculture, and a comprehensive scheme of fodder conservation was submitted to the Government with a view to the preservation of dairy herds during prolonged dry spells.

This scheme suggested the provision of central storage dumps of baled lucerne or other hay, wheaten or oaten chaff in bulk, cereals, &c., at railway sidings, from which supplies could be drawn when needed; some particulars of this scheme were set out in the March issue of the "Queensland Agricultural Journal" in 1923, mention being made of some three and a-half million pounds sterling being required to finance it. The scheme, however, ultimately appears to have been abandoned.

A storage of fodder, such as lucerne or other hay, or grain, at central points on the railway to serve the pastoralists' need would require a large expenditure in the erection of sheds to contain the fodder and silos or other receptacles to hold the grain. The purchase of fodder and grain would be suggested during a season when supplies are abundant and prices low. Allowing that the necessary capital was forthcoming to erect buildings and purchase fodder, it must be expected that the greater demand thus created would tend to increase the market price at which the fodder or grain could otherwise be purchased. Adding to this original cost of the fodder, yearly interest thereon, yearly interest and redemption with upkeep of buildings, &c., yearly insurance premiums, yearly cost of administration, together with freight and handling costs to the holding, it may be expected that the cost per ton when required would approximate that usually paid in the worst seasons. The purchase of fodder, &c., in normal seasons for storage on the holding until required would also for much the same reasons be too expensive to warrant consideration.

Growth and Conservation of Fodder on the Holding.—The improbability of relief country in sufficient area being available, and the ultimate high cost of fodder under any scheme of purchase and storage appearing uneconomical, it remains for consideration to be given to a scheme for the growth and conservation of fodder on the holding.

The fodder capable of growth and conservation on the holding may be summarised as hay from the natural grasses, generally termed bush hay, hay from the cultivated crops, ensilage from cultivated crops, and grain from cultivated crops.

HAY STORAGE.

Bush Hay or Hay from the Natural Grasses.—In any normal season on all holdings there is a luxuriant growth of the natural grasses, which when mown at the right time and properly cured yield a most palatable and nutritious fodder. On the rolling downs where such valuable grasses as "Mitchell" (*astrebla* sp.), "Blue" (*andropogon sericeus*) and "Flinders" (*Iceilma Mitchelii*) predominate, most experienced graziers agree that a yield of half a ton per acre therefrom can be regarded as a conservative estimate on average land, while on the best land this estimate would be considerably exceeded. The grasses most common on the coastal slopes, such as "Kangaroo" (*Anthistina ciliata*), "Bunch Spear" (*Heteropogon contortus*), several "Blue" grasses (*Andropogon* sp.), "Brown Top" (*Pollinia Fulva*), Native Sorghums (*Sorghum Fulvum* and *Plumosum*), &c., can be expected to yield, on a conservative estimate, an average of from 15 to 20 cwt. of hay per acre, with probable increases on the most fertile soils.

Hay from Cultivated Crops.—On the areas devoted to grazing pursuits, largely by reason of a lesser rainfall than is required in general agriculture and dairying, dependence cannot be placed on the rainfall during the winter months in which such crops as wheat, oats, barley, rye, &c., are grown, so that consideration of crops for hay can only be given to those likely to succeed in the warmer months or wet season when the greatest rainfall occurs. Such crops as Sudan grass, white panicum, or Siberian millet, Liberty or Hungarian millet, and Japanese millet are suggested with legumes such as cow peas and velvet beans, as likely to succeed under careful cultivation on the Western Downs, and still more so towards the eastern coast where the average rainfall is greater, while on any holding where there is a sufficiency of water for irrigation, lucerne, the best of all fodders, should be successfully grown. Particulars of these crops in cultivation and yield will be given later.

Curing of Hay.—The nutritive value of any sample of hay depends on the nature and quality of the material from which it is made, the changes and losses, if any, incidental to the process of curing, and the changes which occur after it is stacked. Hay making admits of several variations according to the variety of fodder and seasonal conditions when harvested. There are several conditions which must always be observed to insure a good product. To make the best sample, the crop must be cut at the right time and the curing done so as to secure a bright green colour, good aroma, retention of the leaves and other fine parts, especially in legumes, and absence of dust or mould.

Time to Cut.—The proper time to cut is when the plant possesses the greater amount of digestible nutrients combined with palatability. In cultivated crops, other than legumes, this is indicated by full flowering; in lucerne, when the first flowers appear, or when new growth is starting at the crowns; in other legumes when the pods are well set but not mature. In grasses of perennial habit, more especially those grasses which tend to grow tall and rank, the proper time is just prior to breaking into flower. This is most important since from the time of flowering the amount of woody fibre rapidly increases, digestibility decreases, and palatability in many instances disappears. All pastoralists have experience of the unpalatability of many grasses when well matured especially when the growth has been rank, and, in dry seasons, have been impressed with the indigestibility of an excess of woody fibre in the old grass consumed, when instances of impaction occur. Further, when the plant becomes fully matured, the greater part of the valuable mineral matter contained in the body of the plant during growth passes into the seeds and is consequently lost to the animal when that seed is shed.

In grasses of annual habit, of which "Flinders" affords a good example, palatability is not completely reached until the seeds are fully formed—a probable provision of nature to secure their reproduction. In these cases, cuttings may be deferred until that stage is reached.

The curing of hay lies in the abstraction by drying out of that excess of moisture which would cause deterioration through undue fermentation and the production of fungi and moulds.

The amount of moisture in properly cured hay varies from 10 to 20 per cent., largely in proportion to the crop of which it is made. An indication of a good keeping quality is shown when in stacking it packs well when trodden down. As a general rule, the hay should not feel damp to the hand neither should it be so brittle as to break easily when twisted or bent, while, needless to say, no moisture should be apparent when the stems are twisted.

The time occupied in drying depends on the degree of succulence in the crop and the weather conditions. The dryness and temperature of the soil, the humidity of the atmosphere, and intensity and continuity of sunlight and heat are all modifying factors which continue to prevent any set rule being established. On the Western Downs, where evaporation due to warmth and a very low atmospheric humidity is very great, the curing of hay would be more rapid than towards the coast, where atmospheric humidity is greater. A general fault with hay makers, especially in the North, is to leave the hay out too long before putting it in the stack. With the natural grasses, more particularly in the West, the grass cut in the morning can often be stacked sufficiently cured as hay in the afternoon.

A consideration of the processes the plant undergoes in being cured will be helpful. Various changes rapidly set in as soon as the crop is cut, the most obvious as well as the most important being the evaporation of moisture. After the plant is cut the leaves and stem remain alive for some time, and the leaves continue to draw moisture from the stem if not killed too soon. As the stems are the most difficult to cure, it is obvious that the leaves should be allowed to assist in drawing off all possible moisture. Hence the necessity of protection from the direct action of a hot sun or drying wind by raking into windrows or cocking loosely as early as is directed by weather conditions. On the Western Downs there are days when the mower should almost immediately be followed by the hayrake. Judgment is needed in cocking before the leaves are entirely dried out and their property of drawing moisture from the stems destroyed. Hay cocked in the hot sunshine entraps much warm air, which greatly assists the transpiration of moisture. The size of the cocks will to an extent be governed by the succulence of the material, and they should be narrow and high rather than broad and low. Generally it is not necessary unless rain falls to interfere with the cocks before carting to the shed or stack, but if uncertainty is felt of the completeness of cure of the lower portion of the cock, it may be turned over an hour or so before loading. (Remarks on cocking apply particularly to cultivated crops, as bush hay will be sufficiently cured in the windrows.)

The rate of evaporation depends on the temperature, dryness of the atmosphere, and the total bulk. Therefore, it is very variable, and under favourable conditions is usually rapid. The evaporation of moisture produces a bleaching action which reduces the original green colour; if the material is wet and dried again, it is still further reduced if not entirely bleached. The direct rays of the sun will also have a bleaching effect. A good illustration of the bleaching due to direct sunlight can be gained by wrapping one plant loosely in brown paper and hanging it in the shade, and leaving another exposed to the sunlight until dry. Keen exhibitors at agricultural shows frequently cure portions of various crops for competition as hay or chaff, under cover, with as much light as possible excluded, to retain the bright green colour so desired. During the process of curing fermentative changes occur in the plant, whereby a large proportion of the carbohydrates which are present in the material before it is cut are rapidly resolved into soluble substances; aromatic compounds, probably due to the presence of essential oils, are formed, which, though perhaps of no great food value, impart flavour and render the hay more palatable and inviting. In cold countries seed of the sweet-scented vernal grass is frequently added to that of mixed pasture grasses from which meadow hay is to be made solely for the aroma it is capable of imparting to the hay. The action of rain and heavy dews on hay when curing is to leach out those soluble and aromatic substances with a corresponding loss of nutriment. In experiments carried out in Great Britain it is recorded that as much as 20 per cent. of the nutrients in fresh grass can be lost by weathering. In addition to loss of nutriment, the wetting of hay tends to the production of objectionable moulds, which cannot afterwards be got rid of, and which, while making the hay distasteful, are also at times a cause of digestive troubles. Properly cured hay is very little, if any, less nutritious than the material it was made from at the time of cutting.

Brown Hay.—Brown hay is obtained by cocking before sufficient wilting has taken place or by stacking when insufficient moisture has been dried out; as a result greater fermentation produces sufficient heat to brown or even char the mass. Stacking with excess of moisture due to rain or dew is more liable to produce spontaneous combustion in a stack than excess of the natural moisture contained in the material. This class of hay, though favoured by some users, has nothing to commend it, unless, as in the case of some coarse fodders with hard, thick stems, that, owing to combined heat and moisture, are thereby softened and rendered more palatable. On account of the loss of nutrients in curing, brown hay is not so valuable as the bright green sample, and its production is not commended except in weather that will not admit of curing in the proper manner.

HAY MAKING.

Successful Hay Making.—To sum up, the necessary operations in successful hay making are to—

Cut at the proper stage of growth when all dew is off;

Rake into windrows or into cocks as soon as sufficient wilting occurs;

Allow as much access of air as possible without direct sunshine amongst the curing mass;

Leave not more than from 10 to 20 per cent. of moisture in the finished article;

Prevent wilting by rain or dew at any time after cutting.

While stacking hay, it is a common practice to sprinkle salt and sometimes lime amongst it; the addition of these substances tends to check fermentation and to prevent the growth of moulds. In properly cured hay, these additions are not essential and their use can only be commended when incompletely cured hay has to be stored in bad weather, or in country where it is desired to supply salt to the animals.

Haymaking Machinery.—A considerable number of years ago, though still within the memory of many settlers, haymaking operations were conducted almost wholly by hand, thus necessitating the employment of much labour in the use of sickles or scythes, hand rakes and forks, then the only tools in general use. Since then, the evolution of haying machinery, such as the mower, reaper and binder, horse rake, hay sweep, hay loader, and hay stacker, allows the making of a maximum amount of hay with a minimum of labour.

Mowers.—For making hay on a considerable scale, and especially for bush hay, those of heavy type with a 6-ft. cut are to be preferred. The area which can be cut in a day depends on the nature of the crop, the frequency of turns, and the presence of obstacles to be avoided. A heavy growth of bush grass in which many tough stems of the previous year's growth had to be cut would naturally increase

the draught and decrease the speed of the team. On the open downs of the West where no obstacles are encounterd and where the growth allows of between, say, 10 to 15 cwt. of hay per acre the work of cutting would be easy. Travelling an average of 2½ miles per hour throughout a day of eight hours the team of two horses would negotiate 20 miles and cut slightly over 14½ acres. This area could also be allowed in cultivated crops which, though heavier in yield, offer in eheir succulent stems less resistance to the knives of the machine. Where the mowing machine is fitted to and worked by a tractor the average speed and the area cut would be much increased.

Reaper and Binder.—A machine of this character, which cuts and mechanically binds the crop into sheaves, is not recommended on pastoral areas for hay making, as much more labour is required in subsequent handling to the stack. On agricultural farms it is useful where the crop is to be threshed for grain and the straw saved or the crop cut for chaff to be marketed, as feeding into the chaffcutter with sheaves is easier, and a better cut sample obtained than with loose hay. In districts where the weather is not dependable it is also useful in hay making, as the stooks of sheaves can be more easily protected and are subject to less damage from rain than loose hay in the windrow or cock.

Hay Rakes.—These are of several designs, the most common being that drawn with a single horse which collects the hay in its progress until a sufficiency is gathered, when it is dumped by hand or by mechanical means. Other designs which are an improvement are left and right hand delivery requiring two horses, which gather the hay from the swath and deposit it in a loose condition in windrows, making one windrow to each swath. The left-hand side delivery rake which does the work of a rake and tedder as well, finds most favour, as, working in the same direction as the mower, it deposits the hay on clean stubble in a loose condition with most of the leafage covered up within the windrow. A possible disadvantage in a light crop is that the windrows being limited to one swath would be rather thin; however, where the area cut would be sufficient for two rakes, the use of a left and a right hand delivery would allow two swaths to be put into one windrow.

Hay Loader.—This is a machine that is attachable to a wagon, behind which it is drawn over the swath or windrow; the wheels of the loader in motion drive the mechanism, which picks up the hay cleanly from the ground and elevates it on to the wagon, where it is spread by a man with a fork, while another drives the team until the wagon is fully loaded. The loader can now be detached from the loaded wagon and attached to an empty wagon, which will continue loading operations while the first proceeds to the shed or stack.

A machine of this description is useful when the hay has to be transported some considerable distance to the stack or where it has to be stacked in a shed where a hay stacker cannot well be used.

Hay Sweep Rake.—For rapid transport of hay from the field to the stack when the distance covered is short, these implements are a great saving of time and labour. The rake consists of a platform some 12 feet wide, composed of wooden teeth about 8 feet long by 2 inches by 2 inches, set with centres 12 inches apart, the points of which can be lowered or raised at will by a lever control from the driver's seat. In action the points of the teeth are lowered and the platform forced under the windrow or cock until fully loaded, when the front is raised and the load transported to the hay stacker or elsewhere required. In unloading pins are driven into the ground at the back of the hay and between the teeth, when the implement is backed out until its platform is clear. The most popular type is that in which the two horses are hitched at the rear and propel the machine with the rake or platform immediately in front.

In heavy crops two of these hay sweeps are usual to deal with the cutting of one 6-foot mower, but in a light crop, such as in bush hay in the West, it is considered three of them could handle the cutting of two 6-foot mowers. A load up to 5 cwt. of hay can be carried with ease on each trip.

Hay Stackers are of various designs. Usually a long lever is attached to a mast, with the longer end fitted with a platform to hold the hay, resting on the ground. To the shorter end is attached a rope through a system of pulleys which, giving advantage, enables the horse pulling on the rope to lower the short end, thus elevating the platform with the load of hay over the stack on which it can be dumped where desired. The most approved type is built on a sledge or slide, allowing it to be moved readily to any portion next the stack. By its use stacks over 25 feet in height can be built.

One man with a horse can control the work of the stacker with three or four sweep rakes bringing in the hay, while two men are sufficient on the stack. The load

from the hay sweep rake would be transferred to the stacker by projecting the platform of the former over that of the latter, inserting the pins as previously described, and backing the sweep rake out. The stacker can elevate any load that could be brought in by the sweep rake.

Hay Making Costs.

Cost of Making and Stacking Hay.—Assuming, as is estimated, 10 cwt. of bush hay can be secured from an acre on the Western Downs, and that each mower would cut 14½ acres per day, the cost of a large stack, allowing 20s. per day as wages for men and 2s. 6d. per head per day for horses, could be set down for each 14½ tons:—

	£	s.	d.
Two men and four horses mowing	2	10	0
Two men and four horses with rakes	2	10	0
Three men and six horses with hay sweeps	3	15	0
One man and one horse with the stacker	1	2	6
Two men building the hay stack	2	0	0
	£11	17	6

A cost of a fraction of a penny under 15s. 9d. per ton.

With a heavier yield per acre which the same equipment and labour could deal with, a decrease in cost would result.

Cost of Haying Equipment.—The cost of the machinery equipment considered sufficient to make and stack up to 400 tons of hay in a period of six weeks, on the use of which the estimate of 15s. 9d. per ton was based, according to a recent quotation f.o.r. Brisbane, would be approximately:—

	£	s.	d.
Two 6-feet cut heavy mowers, at £40 each	80	0	0
Two side delivery hay rakes, at £42 15s. each	85	10	0
Three hay sweep rakes, at £28 each	84	0	0
One hay stacker, at £39	39	0	0
Sundries and spare parts, say	11	0	0
	£300	0	0
Add fifteen sets harness, approximately	60	0	0
Add freights and transport to the holding, say ..	40	0	0
	£400	0	0

With reasonable care this equipment would last for many years. Allowing for interest and depreciation thereon an addition of 4s. per ton, when 300 tons was made, would need to be added to the cost of putting hay in the stack, making with the previous estimate a total of 19s. 8d., still under 20s. per ton.

Hay loaders are priced at £52 5s.; the use of one of these would require several wagons or motor lorries for transport according to distance, but would dispense with the purchase of the three hay sweep rakes costing £84. Hay presses are priced as one-horse power £95, and two-horse £133 and £152, according to size. Its use in the field would dispense with the cost of the hay stacker (£39), but require means of transport for the baled hay, in which a ton motor truck would probably be sufficient.

An Alternative to Stack Building.

Baling Hay.—An alternative to building stacks in the field or in carting loose hay some distance to where storage is desired and then building into a stack may be considered in the baling of hay in the field for storage at or near the homestead.

Hay presses are made of various sizes, from that worked by one horse with a capacity up to 10 tons per day, different sizes worked by two horses with capacities ranging from 10 tons to 15 tons per day, to those worked by engine-power pressing up to 30 tons per day.

The weight of bales turned out depends on the size of the bale, chamber of the machine, the amount fed in, and the different kinds of hay, and may be from as low as 50 lb. with the smallest press to 160 lb. each with the largest.

Large sheds would naturally have to be provided to store baled hay, but this extra expenditure might be counterbalanced by the lesser space occupied by the baled hay and the greater facility with which it can be taken out and fed to the stock.

Stack Building.

Building Hay Stacks.—Stack building is recognised as more or less an art of farming, expertness therein only being gained by practice. It is advisable to have a foundation laid on which to build the stack in order to keep the hay from contact with the soil, as thereby some of it is likely to be spoilt. Failing logs, poles, or such like timber, stones, if handy, would make a good substitute. The more circulation of air under the stack the better. In building the stack it is advisable to engage the services of experienced men, more of whom are available in pastoral districts than might be thought. The chief points when building are to keep the centre a little higher than the edges, to keep the walls plumb, and to use the rake freely on them to straighten projecting straws and turn them in a downward direction to run water off and to keep beating rain from entering. Straight poles may be used at the corners and elsewhere, as guides to keep the corners correct, sides straight, and walls plumb, of course being removed when the stack is completed.

While the length of a stack will be governed by the amount of material to be stacked, the width and height will be limited to those dimensions within which the stacker or elevator can lift and deposit the material. When preparing the top of the stack for the covering, especially if thatch is to be used, care should be exercised to see that an even surface without hollows or bumps is maintained, and that in the completed roof there will be a good pitch to run the water off.

Covering Stacks.—As haystacks erected as a standby in time of fodder shortage may not be required for some years their covering to prevent damage from rain is a matter of importance.

Thatch.—Expertness in thatching can only be gained by careful observation and practical experience. Of great importance is the material which may be used. The straighter, longer, and tougher the material the better and more lasting it will be found. On the Western Downs the best material available will be the cane grass usually plentiful near creeks; bulrushes also suggest themselves, but would be probably expensive to secure owing to the necessity of cutting them by hand. On cattle areas, especially on the Eastern coastal slopes, there are many tall-growing fibrous grasses which should answer admirably.

The material to be used should first be thoroughly dried, the loss of leaves and seed-heads being more of an advantage than otherwise, as the flow of water will not be obstructed thereby. An illustration of the manner in which thatch is expected to shed water can be noted by pouring water on a straight, slanting stick. It will be noted that a certain proportion of the water will flow along the stick to the end before falling off, whereas if the stick were held horizontally all the water would fall off before reaching the ends, hence the advisability of giving a good pitch to the thatched roof.

Wet material will sit better and pack tighter than dry material, for which reason experienced thatchers always prefer to damp the heap of thatching material by pouring buckets of water over it; it is then trodden or beaten down to loosen leaves, &c., as well as to compact the mass, so that the straws grasped in a double handful from the bottom, and drawn out by a quick pull first to one side and then to the other, come out in straight lengths.

Thatching is started at the eaves with a double layer to allow a projection beyond the walls to throw water clear; layers of thatch are then put on much in the same way as slates or shingles are placed on a roof, being secured with binding cord or wire held down by pegs about 2 feet long driven horizontally, not vertically, into the stack, and the layer of thatch then combed down with a special rake to keep the straw straight. While thatching is in progress all hollows or bumps should be levelled to make the thatch sit properly, and so best perform its function. A medium coating of thatch well laid will throw off water much better than a larger quantity indifferently laid.

A smart appearance is added to the stack, and water better thrown off, by the even and correct trimming of the eaves, the outer straws of which should slightly project beyond those immediately under them, so that viewed from beneath the projecting thatch appears to be cut horizontally from the outer edge to the wall.

Corrugated Iron.—As an alternative to thatch as a covering for haystacks, corrugated iron may be considered. As a waterproof material and in length of service there is no doubt of its superiority to thatch, so that the question to be considered is that of cost. While thatch can only be used once, corrugated iron, with reasonable care in handling, can be used many times over, in consideration of which it would not be reasonable to charge the total cost of the iron against the stack each time. Probably 15 per cent. of the landed cost of the amount used,

added to the cost of placing on the stack, would form a fair comparison with the cost of procuring the thatch and placing it on the stack. In the Western districts, where thatching material is not as a rule easy to secure and the labour of expert thatchers costly, it will probably be found that the use of iron will be more economical as well as more satisfactory.

The use of iron on a stack does not necessitate any timber for supports, for the hay can be so distributed as to allow the iron to sit snugly on it.

A curved roof is suggested as likely to be the most satisfactory and easiest to put on. The sheets would need to be curved to form a semi-circle to suit a slightly larger diameter than that of the stack, so that the edges would project a little over the sides of the stack to throw the water clear. Each sheet being exactly the same curve as the others should have the bolt holes in exactly the same positions and of exactly the same size, just large enough to receive the bolts used to keep them in place, six being suggested as sufficient in each sheet. The bolts suggested are those generally used with corrugated iron on curved verandas, but, as the nut would require to be screwed on from the top, a lead washer is suggested on either side of the iron as tending to make it more watertight, while a little paint on the top of the nut and projecting thread of the bolt will prevent rust and allow ease in removal and subsequent use.

It would appear advisable to place the first sheet on the top, adding to both sides at the same time while correcting inequalities on the surface of the hay, which should be stacked as nearly as possible to conform with the curve of the roof to make the roof sit snugly.

When all the sheets of iron have been put on the stack and bolted together to completely cover it, a length of 1½-inch or stouter angle iron could be bolted along the sides 6 inches or so from the edge to make for greater stability. To this end 24-gauge iron would be preferable to that of 26-gauge for the roof. As this roof would fit snugly on the hay there would be little likelihood of its being blown off in a gale of wind, but an additional precaution could be effected by passing a stout wire or wire rope over the roof at each end and in the centre, and attaching it to heavy weights or long stakes driven into the walls of the stack.

Protection of Stacks.

Fire.—The greatest danger to which haystacks are subject, especially when built in the open, is that from bush or grass fires. Cropping during the wet and fallowing during the dry season an area round the stack offers the best precaution, while a number of smaller stacks offers less risk of total loss than one large one.

Vermin.—Mice and rats are partial to haystacks as domiciles, especially when seed is contained therein; plagues of these rodents also are liable to appear in most districts, when a great deal of damage might be effected. A sure protection against their entry could be effected by a fence made of sheets of galvanised iron, up which the rodents cannot climb, sunk about 6 inches in the ground and leaning outwards from the direction of the stack, special care being taken with the corners. An additional precaution against those gaining entry when the stack was building could be taken by laying poison round the base of the stack in such a manner that the portions not taken could be collected before any part of the stack was used.

CULTIVATION OF PARTICULAR FODDER CROPS.

Soils.—Naturally the best soil in the handiest position on the holding will be chosen for the cultivation paddock. Where alluvials obtain in sufficient area on river or creek banks not subject to flooding in ordinary seasons, choice of site is easily arrived at. Failing alluvial, the experienced settler will choose a well-drained flat or gentle slope with a reasonably deep soil, the fertility of which will be indicated by the kind of trees growing thereon and the manner of their growth, as well as by the quality and growth of the grasses or herbage present.

On all holdings areas are to be found sufficiently fertile to grow satisfactory crops, yet the addition of animal excreta from the stock or sheep yards will effect a good improvement. Most of the soils in Queensland in districts of light rainfall are deficient in humus and decaying organic matter; the addition of this not only enriches the soil from the amount of plant food thus added, but renders the soil more friable and easier to work, capable of retaining more moisture, and keeps it at a more even temperature, as well as supplying bacteria recognised as of great soil value in the growth of crops.

Most of the soils will be benefited by the use of a phosphatic fertiliser, since phosphoric acid is the necessary element of fertility usually shortest in supply; on country where the cattle are bone chewers, sure indication of its shortage is

thereby given. Quantities of 50 to 100 lb. of superphosphate to the acre in drills with the seed, or 200 to 300 lb. to the acre broadcasted and harrowed in when seeds are sown that way, are considered useful applications and likely to produce profitable results on most classes of country. Other phosphatic fertilisers that might be used are suggested in basic superphosphate, ground Nauru phosphate rock, and meatworks manure. Experiments on small areas, advice on which is available from the Department of Agriculture, will indicate the kind of fertiliser most suitable and the quantity to supply.

The brown soils of the rolling downs country is particularly rich in lime, and will be greatly benefited by the sheep droppings from yards and shearing sheds, while superphosphate in the quantities named may be expected to yield additional profit.

Field Practice.

Preparation of Soils for Fodder Crops.—Few soils should be ploughed deeper than 6 inches for fodder crops, as the humus and decaying organic matter, except perhaps in alluvials, is almost wholly contained within that depth, which also comprises the depth wthin which the bulk of the roots of the fodders to be grown exercise their functions. Ploughing is most effectively done when there is some moisture in the soil, and new land should be broken up some months prior to seeding to allow the fibrous roots of the natural grasses to decay and to sweeten the soil, and reploughed just before planting time. The use of the medium-weight harrows after ploughing will break up the soil to the fine tilth necessary when sowing seed. A thorough preparation of the soil is always of advantage. Seeds are either sown broadcast and covered with the harrow or sown in drills with a planter, to which can be affixed a fertiliser distributor.

Broadcast crops, beyond a possible harrowing or light rolling in some cases, require no further cultivation, while those sown in drills are benefited by scuffling between the rows until the crop is too high for further work.

Cultivation of crops generally means keeping the surface soil, where possible, between plants in a loose and fine condition for a depth of 2 to 3 inches, by which the soil is aerated, weeds are kept down, and evaporation of moisture is retarded.

Equipment and Cultivation Costs.

Farm Implements Needed.—The minimum number of implements for an area of about 60 acres on which fodder crops are to be grown are suggested, with approximate costs, as—

	£	s.	d.
1 2-furrow disc plough	30	0	0
1 set 4-horse equalisers and bars	5	2	6
1 set 4-leaf medium zigzag harrows	8	8	0
1 set 4-horse bars	3	0	0
1 single seed and fertiliser drill	13	10	0
1 double row cultivator	37	10	0
	£97	10	6

to which must, of course, be added cost of transport to the holding. Harness has not been added to this estimate, as it was provided for in the estimate of haymaking equipment.

Where, as in the case on many holdings in the West, a light tractor is used in making firebreaks, use of it also could be made in ploughing and harrowing.

Farming machinery is of many makes and prices; it may be possible to buy the equipment just mentioned at a lower price than that set down, while certainly higher prices can be paid.

Costs of Cultivation.—Amongst farmers great disparities exist in their estimation of the various costs of farming operations; all conditions being fair, using the equipment mentioned, the following costs should not be exceeded for the acre:—

	£	s.	d.
First ploughing, 2 acres per diem	0	15	0
Second ploughing, 2½ acres per diem	0	12	0
Two harrowings, 10 acres per diem	0	6	0
Sowing seed, 6 acres per diem	0	3	4
Harrowing to cover 10 acres per diem	0	3	0
	£1	19	4

Say a maximum of £2 per acre when the crop is broadcasted. When the crop is sown in drills necessitating cultivation between rows, allowance for such cost with the two-row cultivators must be made in three cultivations, at 8 acres per diem at 11s. 3d. per acre, making a total of £2 10s. 7d. per acre or, in round figures, £2 per acre for broadcasted crops, and £2 10s. for crops sown in drills, to which must be added the landed cost of the seed, which varies according to the crop.

Average Rainfall.—Taking the official recorded average of rainfall in districts devoted wholly to pastoral pursuits, it will be found that the only months in which a rainfall sufficient to permit of the successful growth of certain crops might be expected are December, January, February, and March. Sowings of seed would therefore not be advisable after mid-February, but preferably as early as possible after or immediately before the first good fall in December or January.

As previously mentioned, unless irrigation is practised, this rainfall will only permit of consideration being given to those crops succeeding in the warmest part of the year.

FORAGE CROPS FOR HAY.

Sudan Grass.—Probably this crop will be found to be the best of all crops for storage as hay in districts of light rainfall; it not only yields a heavy crop when the rainfall is sufficient but is a good drought resister, a quick grower, and, where the season permits, will yield more than one cutting.* In addition to the heavy yield Sudan grass is very palatable and relished by all kinds of stock. Being a member of the Sorghum family there is a possibility of poisoning in the early growth, but at the time of flowering all poisonous properties disappear, from which period in its growth it can be profitably fed either green or as hay. Cuttings for hay should be made as soon as possible after the first flowers begin to show; if left longer the nutritive ratio widens and the subsequent cutting is not so good. In this connection it may be noted that nature's province is reproduction, and that, while it can, a plant will make growth in an effort to produce seed. Proportionate to the energy devoted to seed production up to the stage of cutting, so may the subsequent growth be affected. Sudan grass makes the most rapid growth under hot conditions, and in the warm months, under sufficient rainfall, the first cutting may be expected in from eight to ten weeks after germination of the sown seed. Subsequent cuttings should be allowable about every six weeks after the first cut, provided there is sufficient moisture in the ground, or irrigation is practised, until cold weather sets in, when growth is much slower if not brought to a standstill. Though the plant will frequently last over a year when seasonable conditions are suitable, it is best to sow seed each year.

The market price of the seed varies according to supply from 3d. to 9d. per lb.

When broadcasted 20 lb. per acre is suggested, and when sown in drills 10 to 12 lb. per acre. Drills should be just far enough apart to allow of intercultivation, 24 to 36 inches being usual.

The broadcasted crop should be harrowed when the growth is about 6 inches above ground, and after each cutting to kill out any weeds, while the drilled crop should have two or more scufflings during the growth of each cut. Yields will depend on the season and quality of the soil, but 1 ton upwards of hay per acre can be expected from most cuttings.

Liberty or Hungarian Millet, sometimes known as Golden Millet, also Foxtail Millet, and frequently miscalled White Panicum, and Giant White Panicum, is botanically known as *Setaria italicum* and *Setaria italicum* var. *germanicum.* It is easily identified from other so-called millets by its cylindrical seed-head tapering to a point.

This crop is usually sown broadcast at the rate of 16 to 20 lb. per acre, when it is desired to make hay from the crop. Seed costs from 3d. to 9d. per lb. according to market fluctuations. It is a quick grower and provides a palatable and nourishing fodder, the first cutting frequently being made in from six to eight weeks. Occasionally a second cutting can be made if the season is propitious. Yields of from 1 to 3 tons of hay per acre might be expected. For hay the crop should be cut just as the flower heads are emerging.

White Panicum, known also as Siberian Millet, is a very valuable crop for feeding off in its young stages. As a hay crop it gives excellent returns under good seasonal conditions, frequently yielding up to 4 tons of hay per acre. Like Hungarian millet it should be cut when just breaking into flower, when it is possible to get a second cutting. The first cutting can generally be made between six and eight weeks' growth. Sowings should be made broadcast at the rate of 16 to 20 lb. per acre. Seed is usually procurable at 3d. or 4d. per lb.

Japanese Millet is a close relation to White Panicum, though under some conditions it may not yield so well. The same remarks as under White Panicum otherwise can be applied.

In making hay from Sudan grass and the millets mentioned a longer time is taken in curing than with natural grasses, owing to their greater succulence or moisture contents. It will be advisable to cure these crops in cocks after wilting in the swath and raking into windrows. A good indication of cure, in addition to that described previously, will be found in a shrinkage at the nodes or joints of the stems.

Legumes.—The value of legumes such as clovers, trefoils, &c., in the pasturage is very well known; equally valuable is their presence in a mixed hay or as a hay to be fed in conjunction with hay from non-legumes; this feeding value is due to their higher content of proteins, which tends to narrow the nutritive ratio of a mixture and permit of successful nutrition with a lesser quantity.

Cow Peas.—There are many varieties; those chiefly on the market at present being Black, Clay, and Blackeye or Mottled, but better varieties are to be found in Groit, Brabham, or Victor, which in trials in North Queensland have proved more vigorous growers and yielders. Sowings should be made thinly in drills, at the rate of 8 to 10 lb. per acre, as early in the season as possible; germination is very quick, usually about three days, while under heat and moisture the growth of plant is very rapid. Cultivation should be effected between the rows of plants until they start to run, when they will quickly cover the surface of the ground. The nutritive ratio of legumes does not alter in later growth as is usual with non-legumes, so there is not the same necessity to cut at a particular time. However, it is usual to cut when the pods are well set but not ripe. Later cuttings, though giving heavier yields, will be found with much more fibrous stems. Though yields of green fodder, of from 10 to 20 tons per acre, have been obtained in the North, equal to from 3 to 6 tons of hay, a reasonable return may be set down in a fair season as from 1 to 3 tons of hay per acre. From 20s. to 30s. per bushel of 60 lb. is the usual price of seed.

Velvet Beans.—Except the Mauritius variety so largely grown as a green manure in the sugar districts, the velvet bean has not been extensively grown in Queensland. The varieties Early Georgia, Early Arlington, and Early Black, though vigorous growers are finer in the stems than the Mauritius variety and better adapted for conservation as hay.

The seed which is about the size of a small marble should be sown in drills 3 feet apart, single seeds being dropped therein 8 to 12 inches apart, allowing 12 to 15 lb. of seed for the acre. Cultivation should be practised between rows until the plants run and the crop cut when the pods are setting, as longer growth yields more fibrous stems. Though not so quick growing as cow peas, cuttings can usually be effected in twelve weeks from the time of sowing the seed. The yield of hay per acre can be set down as from 1 to 3 tons.

As both cow peas and velvet beans are inclined to run together into a tangled mass, they may be considered difficult to harvest; a knife divider on the mower which would be followed by the side-delivery rake will allow satisfactory cutting, after which subsequent operations will not cause much trouble. It should be remembered that in hay making great care in handling is necessary with legumes, so as not to lose the leafage and fine parts which are the most valuable.

CROPS FOR ENSILAGE.

The crops most suitable for ensiling are those with solid, succulent stems which yield a good tonnage per acre combined with palatability and food value; maize, sorghum, teosinte, and pearl millet are examples that might be considered with or without legumes.

Maize occupies first place in popularity where it can be successfully grown, but can be ruled out in almost the whole of the pastoral areas as a suitable crop, since during growth it will not stand up to a dry spell, and requires a more certain rainfall than can usually be depended upon.

Teosinte and *Pearl Millet* can be ruled out for much the same reason as maize, and also for their inferiority in palatability and food value in the maturer stages to sorghum.

Sorghum.—Of all crops for growth in the warmer months in all pastoral districts where the rainfall is unreliable or insufficient for maize, sorghum stands out as easily the best, not only for palatability and nutritive value but for yield.

There are two classes of sorghum, respectively termed saccharine and grain, with many varieties of each. Saccharine sorghums have a sweet, succulent stem, while the seed or grain is more or less bitter to taste; Honey, Sacchaline, Planters' Friend (or Imphee), Early Amber, and Orange are well-known varieties.

The grain sorghums have frequently a pithy stem, especially when matured, while the juice therefrom is not sweet; they are valuable for their yield of grain, which in total nutritive per cent., though a little lower than maize, is higher in proteins, and consequently of narrower nutritive ratio. Such varieties as Kafir, Milo, Feterita, and Kaoliang are well known and popular. These grain varieties possess a good fodder value in the whole plant up to the time of flowering, but when the seed is mature the balance of the plant has lost most of its nutriment.

A third class might be considered as in the broom millets, which are varieties of sorghum but valueless as fodder crops, and only grown for their heads, which are used in making the well-known millet brooms after the seed has been threshed off.

For ensiling, the saccharine group merit most consideration. The best variety for any district will only be arrived at by experiment, but in the warmer districts Honey and Sacchaline might be expected to give the heaviest returns. Pure seed is not always in good supply owing to cross pollination by bees and other insects when varieties are grown in proximity. Seed is usually obtainable at from 3d. to 6d. per lb.

Sowing in drills 3 feet apart is advised, when 5 to 8 lb. of seed per acre will be required; this is most satisfactorily effected with a corn drill, such as the Farmers' Friend, when fitted with a sorghum plate. A harrowing of the area three days after the seed is sown will allow the young plants to come up in a clean seedbed; within a fortnight thereafter the cultivator should be worked between the rows, and the soil kept loose and fine to a depth of 2 or 3 inches, until the crop becomes too high.

All sorghums contain a poisonous principle prior to flowering, before which they should not as a rule be fed. At and after flowering they can be fed without any danger.

For ensiling, a start in harvesting should be made when in flower. A cheap and effective means of cutting will be found in a slide or sledge narrow enough to go easily between the rows and decked with light boarding; a scythe blade is securely attached to the near or left-hand side, preferably through a mortice in the frame of the slide, at an angle adapted to give a slicing cut to the stalks when the slide is pulled forward. A guide rod fixed to the side will allow the stalks to be laid down in a regular swath from which they can be easily loaded on to the slide or wagon, and subsequently handled at the silo.

Crops thus grown can also be cut by hand with a cane knife.

If the season is propitious, sorghums cut at the flowering stage can be expected to make sufficient growth to allow a second cutting. Yields may be expected from 8 to 15 tons per acre from one cutting, but instances of up to 34 tons per acre have been recorded in North Queensland.

Legumes for Ensilage.—As an admixture with sorghum, legumes such as cow pea or velvet beans are valuable in narrowing the nutritive ratio by their high protein content, and are to be commended in that direction. Cow peas would best be grown separately, but velvet beans, which readily climb the sorghum stalks, may be sown in the drills with the sorghum, say, three weeks after its germination by single seeds at intervals of 3 feet. Growth in this manner, it is expected, will not unduly interfere with harvesting operations and will permit of a more intimate admixture in the silo than if fed in separately.

Grain Crops.—As a crop to provide grain for storage in dry times, to feed to stock, including poultry, at any time, or to grind into meal for human use, the grain sorghums stand unrivalled. Cultivation and rate of seeding is similar to that given for the saccharine class, but harvesting, of course, is delayed until the seed is ripe, when it can be detached from the stalk by a hackler driven by hand or engine power.

Yields of half a ton and upwards per acre may be expected under favourable conditions.

With Red Kafir, in the Pentland district, a yield of 2 tons of grain was estimated on the acre, while this has been greatly exceeded in other instances. The variety best suited to each district must be decided after comparative trials, but Kafir, Kaoliang, and Feterita may be suggested as likely to give good results in most districts.

ENSILAGE.

While the curing of a fodder as hay entails the drying-out of sufficient moisture from the crop to ensure that no injurious fermentation or the production of objectionable moulds shall occur, the curing of a crop as silage demands that the natural moisture or juices of the crop shall be as far as possible retained.

The curing of a fodder by the evaporation of its moisture is easily understood, but possibly the factors governing the making of silage are not so well known.

When green forage is cut, fermentation at once sets in, due to the euzymes contained in the plant cells and to bacteria and yeasts retained on the surface of the plant, and if immediately placed in a large heap, thus preventing quick evaporation, as in hay making, much heat is engendered. Should this fermentation be allowed to continue, putrefaction would occur and the material would become worthless except to return to the soil as a manure. The effect of the fermentation during the ensiling of fodder plants is to alter many of the compounds in the plants, such as converting part of the sugars to lactic and acetic acids, &c., which processes are of more interest to the scientist than to the practical stock-feeder. It is sufficient to state that, although the fermentation and heat thereby engendered soften and render perhaps more digestible the harder parts of the stems of the plants used, it does not increase the food value of the silage, while if left to go on too far it certainly lessens it. The object then in making silage is to check the fermentation as far as possible; this is effected by the exclusion of air, from which the oxygen necessary for the progress of fermentation is derived.

Sweet and Sour Silage.—These terms were applied to the material which had experienced a greater or lesser degree of fermentation before such had been arrested. Thus, if the progress of fermentation and consequent generation of heat is slow, more of the sugars will be converted into acids, forming a sour silage, while if the opposite to the case a sweet silage results.

Generally speaking, sour silage occurs in material that has not attained a greater degree of heat than 130 degrees Fahr. On the other hand, when fermentation is rapid and the space confined, a greater degree of heat is quickly reached when at 140 degrees Fahr. Lactic fermentation ceases, and at 160 degrees Fahr. all the organisms will have been destroyed and fermentation arrested until the temperature is lowered and air is allowed access to the fodder. At one time opinions were divided as to the merits of sweet and sour silage, thermometers being used to assist in the control of temperature in the mass, which was effected by alteration in pressure. Investigations however have shown that, except for horses, to which sour silage is injurious, there is little to choose between each in food value, while, if in making sour silage lactic fermentation is allowed to proceed too far, butyric acid will be formed, creating an objectionable smell and taste, as well as rendering the silage inferior. Nowadays there is no particular desire to make sour silage, and if definite rules in the construction of silos and the filling in of the material are followed, the fodder is conserved as silage in its best condition both in palatability and food value.

As previously mentioned, the exclusion of air is the necessary operation in successfully ensiling fodders. This is effected usually by compacting the mass by simple pressure, such as a quantity of earth or by chaffing into a container and tramping down, when, owing to the material sitting so closely, air is excluded and only a few inches on the top are exposed and wasted.

Silos and Silage.

Stack Silage.—Silage can be made by stacking the material and applying pressure either by mechanical means or simply by placing a quantity of earth or other heavy material on the top. Full particulars are given in a pamphlet issued by the Department of Agriculture, "Some Notes on Silage with Special Reference to Stacks," compiled by the Director of Agriculture, Mr. H. C. Quodling.

As, however, there is a greater loss of material in the making, due to exposure of all the four sides of the stacks, they are only recommended in emergency, such as when a maize crop fails for grain, when they should be used within a year of erection, though in the case of large stacks they may be effective for a longer period. For storage of fodder over some years, as a safeguard against dry seasons, they are not recommended.

Pit Silage.—A cheap form of pit silo, in which to conserve the fodder whole, is often made by excavating a trench with plough and scoop, in which it is recommended the breadth should not be more than half the length. Choice of a site will be made of a situation where rainwater will not penetrate from the top or seep in from below ground level, the crest of a rise being most favoured, provided

excavation can be made to a suitable depth. The sides are cut plumb, while the ends are sloped upwards from the bottom, which should be as deep as will allow of the carts, with the material, being drawn in and out. About 60 cubit feet should be allowed as space for a ton of silage when calculating the size of the proposed excavation. When filling, the carts loaded with the material are drawn into the pit, where the material is tipped, successive loads being drawn and tipped over the fodder, thus compressing it until the pit is filled and the fodder heaped above the surface of the ground. The earth from the excavation is now placed on the heaped fodder to a depth of at least a foot, so sloped as to throw off the rain, and the operation is complete, except that a watch must be kept when settlement is taking place to see that no cracks that might let air in appear in the earth covering. On clayey soils, such as is common on the rolling downs, which in dry weather contract, forming deep cracks, this form of silo does not appear suitable, as air and water would thereby gain entrance to the fodder. On country where the soil does not crack they may be made. It is thought, however, where silage conservation is to be commonly practised, silos in which the fodder is chaffed will in the end prove the more economical.

Cylindrical Pit Silos.—In situations that will permit of the excavation of a cylindrical pit with smooth walls to a depth of from 20 to 30 feet, where the earth or decomposed rock will not fret away, and where water will not seep in, very cheap silos can be constructed. Beyond a collar at the top to prevent the surface soil breaking away, no further lining is required. This collar, preferably 4 or 6 feet in depth, can be made with sheets of corrugated iron bent to form a circle about 2 inches greater in diameter than the pit beneath its position. Bolted together in position, and plastered inside with a facing a little more than sufficient to fill the corrugation, of a mixture of two parts fine sand to one part of cement, when completed, the wall of the collar should allow the full depth of the wall of the pit to be plumb.

If considered advisable, the collar could be continued to make a complete lining for the pit, when a concreted floor would make a watertight compartment. It may be thought that a wall of this thickness would be too weak; the lateral thrust of silage when settling has been estimated as 350 lb. to the square foot where the depth of material is 26 feet. As the wall in question would have the backing of the solid earth, no effect would result from this pressure, while it could be expected to withstand any pressure of water from without.

Square pits are not recommended, as it is difficult to get compression and prevent air spaces in the corners, while the walls are very much less strong than when cylindrical.

Overground Tub Silos.—Where the underground silo cannot be economically excavated or where from other reasons one or other of such forms is undesirable, consideration perforce must be given to overground erections. Cylindrical forms are in all respects the best, not only in strength but in satisfactory filling, since the absence of corners allows the material to be evenly packed with the absence of air spaces, unavoidable at the corners of other shapes, while the settling of the material will be more even.

Such silos can be made of wood, wood and iron, or of reinforced concrete. Wood and iron silos have too short a life to warrant serious consideration.

Silos of wooden staves with stout iron hoops are serviceable, but the cost of the timber with transport charges to the holding, together with the painting occasionally of the outside walls and the dressing of the inside walls each time they are emptied, totals a cost in the vicinity of one of reinforced concrete. Wooden silos are liable to damage from white ants and fire while they have a life, against which reinforced receptacles are everlasting and practically indestructible.

On pastoral areas near or on the eastern coastal slopes, as well as in many parts of the Gulf districts, material for concrete is more or less easily procurable from creek or river beds, but on such areas on the rolling downs sand or gravel is usually unobtainable from such sources except at great expense in transport. A solution of the difficulty has been suggested in breaking up the pebbles or other stone available on or near to every holding in a stone crusher. When portion of the crushed material is put through a second time, with the crusher set to the smallest gauge, it is thought a sufficiency of fines would be secured to make up a suitable aggregate.

Plans and specifications of reinforced concrete silos of different sizes may be had gratis from the Department of Agriculture, and also, where payment of freights both ways and care in use is promised, moulds for certain sizes will be loaned without other cost.

Taking all things into consideration the reinforced concrete silo appears to be the most economical, and can be considered as a permanent improvement on the holding.

Sizes of Silos.—The size of a single silo will be governed by the number of stock to be fed. Whatever the type, a certain area must be exposed when the material is being fed. Silage quickly detriorates if exposed to the air for more than twenty-four hours, consequently it is imperative for best results that a thickness of 3 inches of the exposed surface should be removed daily; whole silage as fed from stacks may be calculated as weighing, roughly, 40 lb. per cubic foot, and chaffed silage as fed from containers as, roughly, 45 lb. per cubic foot. On pastoral areas, however, where large numbers of stock would be fed, this would be of little moment. Cylindrical silos preferably should not be of larger diameter than half the depth. The deeper the silo the greater the compression by the weight of material above, while with the smaller area exposed the less wastage there will be in fodder material.

In stack silos and excavated trench silos it was shown how air was excluded by pressure applied mechanically or by quantities of earth, which latter also helped in that direction.

In silos where the material is chaffed before filling in to containers with air-tight walls, it is evenly spread and trampled down to compact the mass, which in its chaffed condition will naturally sit closer than when fed in whole; ½-inch or ⅝-inch lengths are usual in chaffing. Silos should not be filled too quickly—it is usual to fill not more than one-sixth, preferably one-tenth, of the capacity daily—this allows of better settlement and of filling the receptacle more completely than if larger quantities were put in each day.

When filled with the chaffed material without topping with other material, if well trampled, some 6 to 9 inches can be expected to deteriorate, but if green grass is chaffed to cover a depth of 6 inches and wetted, it will form a close mat with the fungi developed excluding the air with practically no waste of the fodder beneath. Well-made silage can be expected to keep in good order until required; the period of storage after which the contents of the best type of silo commence to deteriorate has not yet been determined.

GRAIN CROPS.

The amount of rainfall, based on the average of a number of years, that may be expected during the growing season is a deciding factor when consideration is given to crops that might be grown for special purposes in any district.

In the districts devoted mainly to pastoral pursuits, the rainfall is insufficient on the average to allow maize to be grown successfully for grain. Of other summer crops the grain sorghum varieties alone are worthy of serious consideration for the production of grain for storage against times of fodder shortage, or, as previously mentioned, for present stock use or for human consumption. The value of maize grain is appreciated by reason of its general use, but that of sorghum grain is not so well known.

A comparison of the nutritive values will show that sorghum grain is very little inferior to maize in total food value, while in average protein content it is usually higher. The following analyses from Henry and Morrison's "Feeds and Feeding" will afford a useful comparison in pounds of digestible nutrients per 100 lb. grain.

Variety.	Proteins.	Carbohydrates.	Fats.	Total.	Nutritive ratio.
	Lb.	Lb.	Lb.	Lb.	1
Dent maize	7·5	67·8	4·6	85·7	10·4
Flint maize	7·7	66·1	4·6	84·2	9·9
Kafir sorghum	9·0	65·8	2·3	80·0	7·9
Milo sorghum	8·7	66·2	2·2	79·9	8·2
Feterita sorghum ..	9·3	66·6	2·5	81·5	7·8
Kaoliang sorghum ..	8·5	67·0	3·3	82·9	8·8

As protein is the most valuable part of a food, the extra amount in sorghum grain should more than compensate for the lesser quantity of the total carbohydrates in maize, and allow it to be sold at an equal price. It may be noted that in calculating the value of fat as carbohydrates, the quantity is multiplied by two

and a-quarter. The sorghum varieties usually cultivated do not yield so well under a heavy rainfall, but compared with maize under a lighter rainfall and on poorer soil will give very much higher yields. At Roma a yield as high as 120 bushels per acre has been estimated, while at Pentland 81 bushels of sundried grain was estimated on soil that would not yield 20 bushels of maize. The cultivation of grain sorghums is exactly similar to that set out for saccharine or fodder sorghums. In feeding to horses or cattle, the grain being small should first be crushed, as much of it would otherwise not be digested. With sheep, however, mastication is better, and crushing not imperative.

Storage for a lengthy period, as with maize, could be effected in airtight corrugated iron tanks. These tanks, usually of 1,000 or 1,200 gallons capacity, are provided with a manhole with a close-fitting lid on the top for the reception of the grain, and a spout with close-fitting cover on the side at the bottom for emptying the grain as desired. When filling, the grain, which should be thoroughly dry, is poured into the tank and worked with a stick to fill the corrugations until the tank is full; the top of the tank is then lifted as far as possible, and the grain packed under, so that when the lid is put on the top of the tank is somewhat domed. The lids are now luted with putty or other suitable material to render them airtight, when the grain can be expected to keep in good feeding condition indefinitely.

Irrigation.—The extent to which irrigation can be practised will be limited by the supply and quality of the water available. On some pastoral areas a good supply is available from lagoons and running streams, or can be conserved by building dams across creeks which give only a small flow in dry times. On the Downs country, where the flowing bore drains have to water more than one area, it is frequently impossible to obtain a sufficiency to make irrigation worth while. There are, however, holdings where the supply is sufficient, if the quality allows, to irrigate areas up to perhaps 10 acres.

Quality of Water.—In running streams the water is almost invariably suitable for irrigation, yet that from artesian bores is sometimes unsuitable, due to excess of dissolved matter injurious to vegetative growth. Generally speaking, where the water is satisfactory for domestic purposes, it can be used in irrigation, but where there is any doubt an analysis with advice as to its value can be obtained from the Department of Agriculture for a fee of 10s. 6d. In sending samples clean bottles and corks should be used, and well washed with the water to be analysed before the bottles are finally filled, labelled with identification thereon, and sent securely packed to the Under Secretary, at Brisbane.

If desired special bottles for holding the water may be had from the Department on application.

CROPS TO GROW.

As irrigation, however practised, adds to the cost of production, when compared with that under a sufficient rainfall, it can only be seriously considered for crops of the greatest nutrient value which cannot be economically produced under the ordinary average rainfall.

Except legumes, such as cow peas and velvet beans, all the crops produced on the pastoral areas, under the wet season rainfall, for conservation as hay or ensilage will possess a wider nutritive ratio than is desirable for economic feeding; that is to say, that their protein content is insufficiently high in comparison with the carbohydrate content, necessitating the feeding of a larger quantity to each animal than is required to supply the requisite carbohydrates, thus wasting the excess of the latter.

The admixture of a fodder rich in protein, by which the proteins and carbohydrates can be supplied in the desirable proportions, will allow smaller quantities of the mixed fodder to be fed than would be imperative with the fodder in which protein was in short supply. This matter will be dealt with more fully later on in notes on Animal Nutrition.

As hay from the natural grasses, as well as from non-leguminous cultivated crops, is low in protein, it would be most desirable when the expense of irrigation is undertaken to grow a crop that will not only be palatable and rich in protein, but one that will give a good return.

Lucerne, aptly described as the king of all fodders, is not only high in protein content, but when once established will, with proper attention, last over many years, instances of areas producing good yields after being laid down for upwards of twenty years being not uncommon. The crop does not make quick growth under cold conditions, but with sufficient moisture in warm climates eight and nine cuttings are often made during the year, thus averaging one cut every six weeks.

It should be especially valuable on the pastoral areas of Queensland, as cuttings could be obtained under the natural rainfall of the wet season for probably five months of the year, and under light to heavy irrigation during the remaining seven months.

Field Work.

Soil.—Contrary to general opinion lucerne can be successfully grown on almost any kind of soil; there are two defects, however, that are prejudicial to growth that must not be lost sight of when choosing the site for sowing. The first is a soil constantly wet, or so badly drained that water will remain on the surface for two or three days after heavy rain or where water is permanent within 4 or 5 feet of the ground surface. The other condition is where there is too much acidity in the soil; this is often but not always associated with bad drainage, and can be overcome by attention to drainage and the application of lime.

Like many legumes lucerne thrives on a soil rich in lime, preferably of loose texture, such as an alluvial loam which will allow easy and deep penetration of the roots. The soil of the rolling downs possessing as it does a good lime content, frequently upwards of 1 per cent., should be very suitable when the crop is sown on a gentle slope to allow of satisfactory drainage. Very few pastoral holdings where water is available for irrigation will be unable to supply an acceptable area of soil suitable for the crop.

Preparation.—It is inadvisable to sow lucerne seed on land newly broken up; soil that has grown one or two crops previously will show a much better result, and still better if the crop immediately preceding was cow pea.

The soil prior to seeding should be well worked by ploughing, cross ploughing, and harrowing to a fine tilth, and will also be benefited by subsoiling a foot or so below the depth of the ploughing.

Manure.—The addition of animal excreta or other organic matter that will soon decay in the ground for the previous crop, will greatly improve the soil in fertility and mechanical character, while topdressings from time to time of a phosphatic fertiliser can be expected to prove profitable.

Sowing.—Drilling the seed in is a very satisfactory method, requiring less seed per acre and giving a more even distribution; where other work for such a seed drill is not called for, purchase is not warranted.

Broadcasting the seed is the usual practice; experienced sowers can secure a fair stand with 15 lb. per acre, but in general 20 to 25 lb. of seed per acre are recommended. If the seed is mixed with an equal bulk of sawdust, a more even distribution will be assured, but care must be taken to see that the mixture is thorough.

Sowing half the seed up and down and the other half across the field is often practised to ensure a more even distribution.

After the seed is sown the land should be rolled to cover the seed and to firm the seed bed. In Queensland the best time to sow the crop is towards the end of the wet season, March or April being indicated, when cooler weather is setting in. Earlier sowings are not advisable, as the young seedlings are apt to be scorched off under a very hot sun, and in addition will have to contend with the heavy weed growth usual in the hot months, while a heavy storm immediately after the seed is sown may wash much of it away. There should at this time be sufficient moisture in the ground to ensure germination and satisfactory growth until irrigation, if necessary, can be applied.

It is not considered a good practice to flood lucerne during the first six weeks of its growth; if the land has insufficient moisture and there is little likelihood of rain, a flooding of the land prior to sowing is advocated.

If a fair stand is not secured from a sowing it can be thickened by reseeding after a good discing or heavy harrowing following the first cut.

Harvesting.—Cuttings should be made, provided there is reasonable prospect of curing as hay, when the first flowers begin to show or a new growth is coming from the crowns. If before this time a weed growth is abundant, cutting of the area should be effected before any of these weeds have time to seed. Some growers prefer to cut when half the field is in flower. Cutting at the time recommended allows better retention of the leaves, while the protein content is also higher at that time. Further, nothing is eventually lost, as any additional growth is secured in the next cut. After every cut the crop should be well harrowed both ways, or if a disc harrow is available its use with discs set straight will be further

advantageous. An attempt to pull up one of the plants by hand will convince the doubtful that the harrowing or discing can do no harm. Discing has the advantage of splitting the crowns, thus enabling them to send out more shoots, as well as of loosening the soil and cutting out any weed growth. The cutting of lucerne is invigorating to the plant, and should be promptly done when weeds are troublesome or when the plants show any yellowing, even if such cut is not worth recovering.

Curing Hay.—The greatest value in lucerne lies in the leaves, pointing to the necessity of care in handling during curing operations. As mentioned earlier, under hay making, the leaves if not killed too quickly transpire moisture from the stems, hence the advisability of cocking before wilting of the leaves has proceeded too far. Where the shed space is large and the quantity added to the stack at each cut not too large the cure could be completed there.

When Irrigation is Practised.

Irrigation.—Two methods of applying water in irrigation are possible—viz., by flooding and by spraying. In flooding it is essential to have the ground prepared before sowing the seed, whereby all inequalities are removed, humps being levelled and depressions filled, to assist towards an even application of the water. In flooding water is applied in two ways—by flowing in a thin sheet at an even depth over strips of ground with an even fall until a desired saturation has been accomplished, or by covering level areas with a sheet of standing water until sufficient has been absorbed, when the balance is drawn off, or by supplying the quantity desired to the area, around which check banks have been made. A large supply is necessary for irrigation by flooding. Where water is not available in large amounts, a system of spray irrigation will prove the most advantageous, and will not necessitate the careful grading of the land, as is required when flooding.

Several systems of applying water by sprays have been evolved, but that in which distribution through perforated pipes on permanent erections overhead is effected appears to be the most satisfactory. In this system the water is pumped through the small perforations as a spray to a distance dictated by the pressure from the pump. By a contrivance operated by the flow of water from the pump as it enters the spraying pipes, these are gradually turned half round and back again mechanically, thus allowing the water to be applied evenly on either side at the rate it will soak into the ground, dispensing with any need for constant supervision. The lines of pipes will be regulated by the area of the land to be irrigated. This system is economical in regard to water, and offers an additional advantage in its aeration and fall like rain, while it does not compact the soil as is usual in flooding.

Applications of Water.—The amounts of water to be applied in irrigation are determined by that actually taken up by the plant to produce a certain growth, that lost by surface evaporation from the soil, and that lost by running off the surface, and by under drainage. To go into details regarding these matters would need the preparation of a special article. The evaporation of moisture from the soil and by transpiration of the leaves will be greater when atmospheric humidity is low, and will be much greater on the rolling downs in dry weather than nearer to the coast.

Suitable applications will be determined by experience, but it is suggested that, without any rainfall, 4 inches per acre, roughly 90,000 gallons, would be a maximum to be applied for any cutting, while 2 inches, or about 45,000 gallons per acre, should afford satisfactory returns either as one application after cutting or half when cut and the other half two or three weeks later. Water should not be applied within two weeks of cutting. In districts where the winter is cold and growth slow, the application could be light enough to keep the plants healthy until warmer weather sets in, when heavier applications could be made. Where water was in short supply, light irrigations could be made during the dry months, so that the plants would be kept sufficiently vigorous to take full advantage of the rains during the months of the wet season.

On areas where a sufficient amount of water could not be spared to allow the application when desired being taken from the bore drain, the practicability of an excavation for storage of that amount, which could be spared daily, to allow of such application might be worthy of consideration.

Yields.—The amount of hay to be made from each cutting will vary according to seasonal conditions, quality of soil, &c., but under fair conditions, on reasonably fertile soil, an average of 15 cwt. of hay might be expected from an acre, or 4 tons upward during the year.

Other Crops.—Though other crops can be grown successfully under irrigation, none can compare with lucerne in profitable return, where conditions will allow its production.

Berseem.—In Egypt, Berseem or Egyptian clover is grown very extensively, yielding a crop quite as heavy and rich in nutriment as lucerne. It is, however, an annual, and grown only in the cooler months of the year, while as a hay it it more brittle and less suitable for storage than lucerne.

Berseem, however, has one advantage over lucerne in that it can be grown on soils in which while alkali is present in amounts that would be injurious to lucerne, indicating its possible value under irrigation from some of the more alkaline bore waters.

Sowings are made usually at the rate of 20 lb. per acre, similarly to lucerne, at the end of March or early April, when the first cutting may be made in eight or nine weeks, and others five or six weeks thereafter until September or October, when the plants may be expected to die out.

Berseem has not been grown to any extent in Queensland, but in the irrigated areas in the north-west of Victoria it has provided heavy cuttings; in America, under irrigation in arid areas, it has also yielded well, while, as previously mentioned, it is universally grown in Egypt.

There does not appear any reason why it should not do well in Queensland, especially under irrigation in winter, as then it makes a better growth than lucerne, but, except as a catch crop or on soil or with water unsuitable for lucerne, it is not recommended in preference.

PASTURE IMPROVEMENT.

The improvement of pastures may not be viewed as any safeguard in prolonged periods of dry weather, when growth of any kind without irrigation is an impossibility, yet many graziers will agree that, even under the influence of good seasons, there is room for improvement in this respect, and that a better pasturage will provide a stronger animal with greater vitality to face periods of food shortage.

Stock, when grazing, naturally select those growths most pleasing to their palates, which are also, as a rule, the most nutritious, neglecting those less palatable, generally of a coarser nature and mostly of lower nutritive value. The result may be expected in a greater reproduction of the latter at the expense of the former.

Instances may be cited on the coastal slopes of the spread of bunch spear, three-awned spear grasses (wire grasses), &c., and many weeds such as sida retusa, flannel weed, star burr, &c., whilst on the rolling downs the spread of feather top (*Aristida* sp.) is becoming a matter of some concern.

Pastoralists of forty to fifty years' experience have remarked on the change from the early years of settlement in the North, when fat cattle could be had all the year round, to the present when, under similar seasons, fats as a rule are only available during one portion of the year.

A suggestion of the prevalence of legumes as slender vines growing amongst the grasses in those early years, with a scarcity or total absence in recent years, has been agreed to very generally, both by those with lengthy experience with cattle on the coastal slopes and with sheep on the rolling downs of the West.

The value of the legume in pasturage is so well understood in the case of clovers, &c., in cool climates, that the disappearance of these, which perform a similar function, may be held as largely, if not wholly, responsible for the change noted.

It was remarked previously that Flinders grass, being most palatable to stock after its seed was fully formed, instanced a provision of nature to ensure its reproduction. So with many legumes is the growth not so palatable when young as when the seed has matured or the plant has lost most of its moisture. Stock at first do not take kindly to green lucerne, while readily eating it as hay, and it is only when hungry or after they have developed an appetite for it that it is eaten readily. Heavy stocking, as well as scarcity of feed in dry seasons, has probably resulted in the consumption of these native legumes, such as species of Rhyncosia, Glycine, &c., once so common, before they have been enabled to mature their seeds, and thus provide for reproduction.

Pasture improvement is often effected by the application of fertilisers as a top dressing to the soil, but cannot be considered on large pastoral areas, as the expense could not be met by a sufficient increase in return. The fertility of land devoted to pasturage, on which stock graze, is so little depleted after many years as not to warrant the application of fertilisers, except where, in its original state, improvement might have been effected.

A consideration of improvement of the pasturage on large grazing areas is suggested in provision for adequate reproduction of existing good grasses and legumes, and the introduction of others. In either case the necessity would exist for annually locking up portion of the area until the desirable growths, either existing or supplied, had shed their seed. This would entail cutting up the area into different paddocks to allow of one being so treated each year, a proposition probably considered impossible by many.

The prosperity of the State is influenced by the returns from pastoral industries, so it must be considered that the pasturage is a national asset, and its deterioration or improvement a matter of great importance.

Length of tenure will be a deciding factor with a lessee when giving consideration to improvements in any direction on the holding, more especially in pasture improvement, where no provision is made for valuation of such at the termination of his lease. A suggestion has been made for clauses in the lease to compel improvements in this direction, and also in the conservation of fodder and the number of stock to be carried. Compulsion is ever unpopular and usually incites opposition in an endeavour to defeat its object. Probably provision for reward, by way of remission of portion of the rental, extension of tenure, or in other directions, would more readily meet approval, and result in a commendable attention being paid to those matters, which might be expected to lessen the losses of a dry period and increase the returns under normal seasons.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

THE FUTURE OF THE COUNCIL OF AGRICULTURE.

MINISTERIAL STATEMENT.

The Acting Premier, Hon. W. Forgan Smith, as President of the Council of Agriculture, made the following announcement to the Press recently:—

"As I have pointed out previously, it was found necessary in the initial stages of the movement, in view of the disorganisation of the agricultural industries, to establish the Queensland Producers' Association, of which the Council of Agriculture was the executive body, on an extensive basis. The principal of the many important functions of the Council under the initial legislation—'*The Primary Producers' Organisation Act of* 1922'—was the organisation of the marketing of primary products under the control of boards elected by producers. It was recognised that the advent of marketing boards involved the devolution of the Council's main functions, in that with the establishment of each such board, it was able itself to deal more efficiently with problems affecting producers in the industries involved; hence the several amendments of the initial legislation meant the curtailment of the Council's functions and the effecting of economies in so far as the central or parent organisation was concerned.

"In 1926 there were thirteen commodity boards in existence. These controlled between them primary products to the extent of 75 per cent. of the total value of Queensland's primary production (the calculation is based on figures supplied by the Registrar-General for the year 1925, and excludes the grazing industry products). Obviously, therefore, the bulk of the more important work for which the Council or central organisation was established was performed, and I, therefore, with the concurrence of the representatives of the various boards, introduced a consolidating measure known as '*The Primary Producers' Organisation and Marketing Act of* 1926' effecting amendments in, and amalgamating the Primary Producers' Organisation and Primary Products Pools Acts. This Act clothed the various commodity boards with greater powers, and provided for a further devolution of its powers by the Council of Agriculture, and also greater facilities for the organising of such of the rural industries as had not yet taken advantage of the opportunities offered them to secure control of their own affairs within the limits of the legislation provided. The result was an immediate saving of expenditure by the Council of more than £15,000 per annum.

"Foreseeing the possibilities of further curtailments of the Council's activities, I had the measure drafted on sufficiently broad lines to permit of such being effected without involving further legislative action. When, therefore, the Council, at a special meeting held on 1st April instant, decided upon a further devolution of its functions, involving the elimination of expenditure in the maintenance of a central organisation and the cancellation of the precepts issued on commodity boards some time ago, it merely reached a decision the Government had foreseen—one that does not require any alteration of the Act. The Council, of course, will continue to exist, but its operations will be reduced to a minimum, and such expenditure as is found necessary in this connection will be contributed *pro ratâ* by the commodity boards. Incidentally, the Council's decision means the abandonment of compulsory contributions to the "Queensland Producer" newspaper. The paper is to be continued, but in future it will depend upon voluntary subscriptions, the same as any ordinary commercial newspaper.

"Briefly, therefore, it may be said that with so many control boards operating in respect of the primary industries, in the formulation of schemes for the organising of the principal of the remaining unorganised sections of the industry and the provision of funds necessary in connection with the submission of same to growers, in the making of a number of efforts to organise the cattle-grazing industry, and in the knowledge that all the machinery exists in '*The Primary Producers' Organisation and Marketing Act of* 1926,' whereby unorganised industries are provided with facilities for becoming organised, the Council of Agriculture feels that it has, for the time being, practically done its job, and can do nothing more for any industry which that industry is not in a position to do for itself, and that in the circumstances it is no longer justified in maintaining a fairly costly central organisation.

"It may be remembered that in discussing the matter some time ago on the occasion of the introduction of amending legislation, I likened the Council to the scaffolding used in connection with the construction of a building. The building referred to was the commodity system of organisation that was being set up. Once the building had been erected, I stated, the scaffolding had done its work and could be removed. That is precisely what the Council's recent decision means—the scaffolding has been removed. All the material, however, is still on hand, and should the structure at any time need repair or alteration, the scaffolding can very easily be re-erected."

POULTRY HOUSING.

INTENSIVE LAYING SHEDS.

By P. RUMBALL, Poultry Instructor.

There are several systems of housing laying stock, but the intensive system should prove most attractive to the general poultry raiser.

Under this system of housing the birds are kept entirely under cover in fairly large sheds, and in relatively large numbers. This being so, strict attention has to be paid to the physical condition of the bird, and to the question of feeding. As the bird only has a very restricted space, 4 square feet per bird being about the correct area, exercise has to be promoted to ensure the birds being kept in good condition. This is done by having scratching material or litter, such as grass, straw, leaves, or chips strewn over the floor, to the depth of 4 to 6 inches, and all the grain portion of the ration being fed in it. This naturally promotes a good deal of scratching on the part of the bird in search of grains that have become covered, and it should be patent to all poultry raisers that the feeding of the evening grain should not be left until the day is drawing to a close. Many farmers are in the habit of allowing a good deal of range to their birds, with the consequence that they gather a fair amount of natural food, and naturally do not consume as much as birds kept entirely under cover. If at any time poultry breeders keeping birds under such conditions think it desirable, on account of the damage done by their poultry to crops, haystacks, &c., to change over to the intensive system, the question of feeding assumes a most important point; in fact, any person keeping poultry under these conditions must give the question of feeding the utmost consideration, as it is impossible for the birds to procure anything but what they are supplied with. The overlooking of this point by many poultry farmers has caused this system of housing to be condemned.

This system of housing poultry enables a greater number of birds to be kept on a given area than any other. It permits of birds being handled in large units, and therefore not only reduces the natural labour but goes a long way in reducing the cost of production, which is a big feature, especially in times of high-priced foods. It is also much easier to detect sick and unproductive birds in an area of, say, 400 square feet than is the case when large runs are used, and therefore the early disposal of these, a practice highly desirable, is facilitated. With this system also there is generally greater attention given to the questions of the construction of the houses and the numbers housed in a shed of certain dimensions. Both these questions play a very important part in the question of disease, and the development of stock. It is not uncommon to notice a house built to house at night fifty laying hens having sixty-five birds in it. To do this, possibly the perches have been placed closer together, and when it is suggested to the breeder that he is overcrowding, he states that they only sleep in the shed and he lets them out on free range during the day. Although it must be admitted that stock on free range will possibly put up with much severer conditions than those kept in pens, it is maintained that it does not matter how good the conditions are during the day, they will not overcome the ill-effects of overcrowding during the night. With the intensive system of housing, overcrowding is not noticed to the same extent; the breeder knows how many birds the shed was built for, and there is no point that can be raised in favour of going beyond this number.

Types of Intensive Laying Sheds.

There are several types of laying sheds, the shape of the roof being the principal point, but as the majority of poultry raisers have to do the erection of their own sheds the lean-to type will prove most acceptable. The illustration shows the cross section of a shed, 20 feet deep, and of indefinite length. This shed can be built in sections of 20 feet, and provision made for additions as required, each section holding 100 laying hens.

The cross section shows a veranda, which commences just under the rafters in front. This veranda serves to prevent a good deal of rain beating into the house from the front, and by not going right to the top of the roof allows a free circulation of air. If it is desired the roof could be extended by 3 feet and the veranda not used, but in that case the height of the shed in front could be a little bit less. Ventilation is also provided for at the back, the iron going from the floor level to the bottom of the 6-inch rafter. This allows a 6-inch space right along the back of the shed between the battens which carry the iron at the back

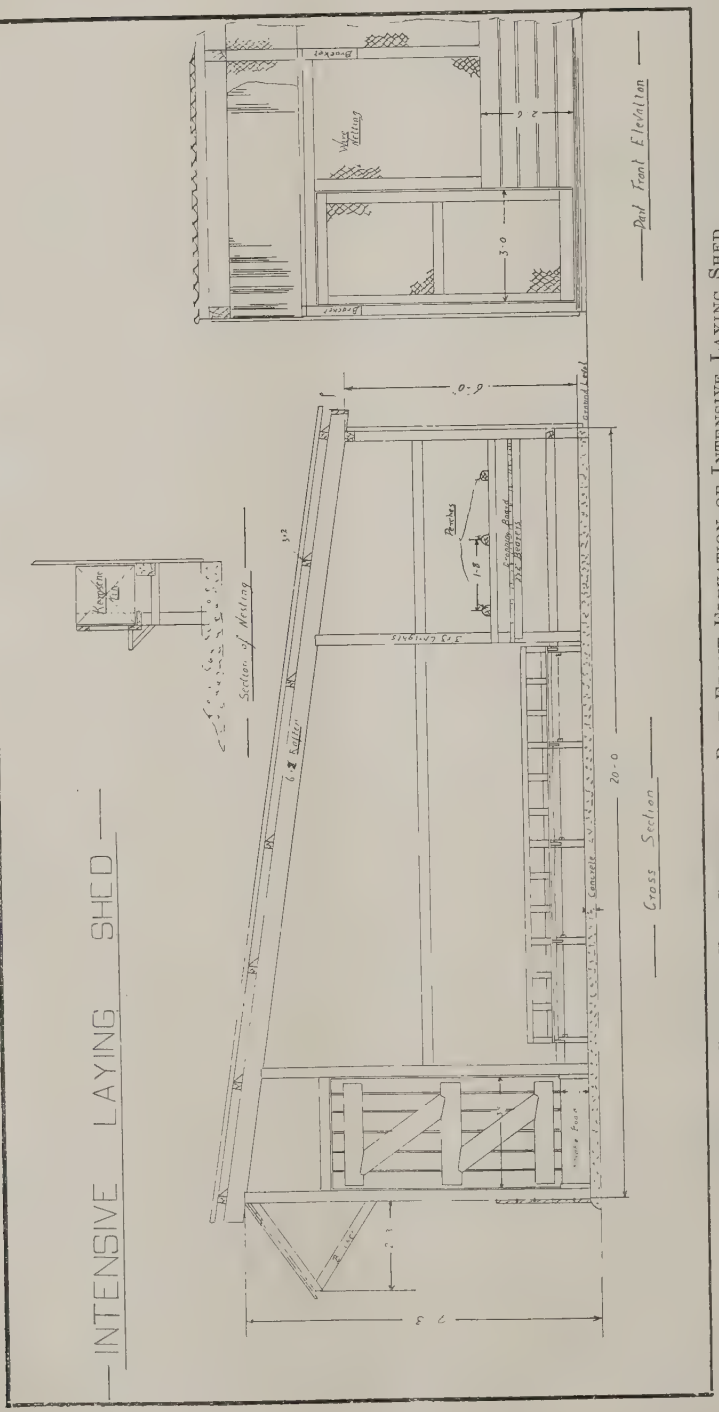

PLATE 103.—SHOWING END SECTION AND PART FRONT ELEVATION OF INTENSIVE LAYING SHED.

End Section, with the exception of door and battens to carry the iron, should be erected every 10 feet in a shed of these dimensions.

and the roof. This space is protected to some extent from the driving influence of the wind by guttering being placed on the rafters, which extend beyond the back wall, but further protection for the birds from cats, &c., should be made by netting this space.

Materials.—The shed should be built with good, sound hardwood posts, although where desired solid, sapped bush timber could be used for uprights, but the average builder would find sawn timber easier to handle. All other frame work should be sawn timber, that coming in contact with the ground hardwoods, and the balance pine. The dimensions of the timber are shown in the cross section, and as the building is of goodly dimensions it would not be advisable, on the plea of economy, to use lighter material. The walls and roof should be of iron, and also the wind break in front, although timber, if cheaper, could be used.

The Site.

Site of House.—In commencing to erect a building upon the intensive system, it being a large building and of a permanent nature, the site chosen must receive due consideration, and, as many poultry raisers start in a small way, provision should be made for extensions.

In addition to the foregoing, although it is recommended to concrete the floor, the position chosen should be well drained, and, if the building is to be erected on relatively flat country, the floor should be raised several inches above the surrounding country, and well rammed to provide a solid foundation.

Aspect.—The house should face north or north-east. A northerly aspect permits of the maximum penetration of the sun's rays into the house during the winter, when it is desirable, and the minimum during summer; also a good deal of our continuous rains come from a south-easterly direction.

The Layout.

General Fittings.—In the cross section a door constructed of timber is shown, while the front elevation shows another of netting. Although this shed is built for the purpose of keeping the birds entirely under cover, it frequently is desirable to let the birds out into small runs during cleaning operations, or it may be that, in a long section, it is desirable to go into a pen direct. This is only possible when front doors are provided. The door in the end section permits a person feeding &c., going from pen to pen direct, and, for the small cost in labour and material, both doors should be provided when the building is first constructed.

The perches, three in number, are placed along the back of the shed extending the full length. Under the perches is a dropping board. The advisability of this or otherwise is left to the individual breeder. If it is not to be cleaned daily, it should not be provided, but for the breeder who uses it there is a ready market for pure poultry manure, while, at the same time, he keeps his litter clean for a longer period. Another system by which the droppings may be kept from mixing with the scratching material is by placing timber, say, 6 inches in front of the front perch the full length of the building. This timber would need to be at least 18 inches high, and it may be as well to cover the whole area with netting to prevent the birds from getting in among the droppings. This pit, however, would need to be cleared out fairly frequently to prevent offensive odours, as there would be nothing to absorb any moisture. With the dropping board the birds have the full floor to scratch over, but a sharp lookout must be kept for red mite, as it provides additional harbour for them.

The nests are shown supported on a framework on the side of the building. These are kerosene tins on their sides. Two-thirds of each side is cut out. This provides a top which assists in keeping clean nests, and by both sides being cut the excessive heat is reduced. These should be placed at the coolest end of the building. Even although nests are provided many birds will persist in laying under them or in some old corner. If this is the case, the nests could be placed on the ground, as it is as well to induce the birds to make use of them to keep the eggs as clean as possible. Drinking and feeding receptacles are left to the breeder's own device. Some may be able to make use of some form of automatic water system, others may have to depend upon the kerosene tins. Some breeders may use dry mash hoppers, while others feed a wet mash. The principal feature is to provide ample water and sufficient feeding space for your stock. It is better to overdo both these features than to economise in this direction.

MENACE OF THE POULTRY TICK.

A PEST CONCERNING ALL POULTRY RAISERS.

By P. RUMBALL, Poultry Instructor.

The poultry tick is the most serious pest confronting the poultry industry in Queensland to-day; despite this fact, however, the majority of breeders whose premises are not infested give it no consideration.

This certainly does not assist in eliminating the danger of the tick being distributed from farm to farm, nor does it assist in its eradication.

Mr. Rumball describes how the tick is spread from farm to farm in the following article. Some of these ways may be controlled by the breeder, but the distribution of the tick by wild birds is outside the province of the breeder, and for this reason alone every poultry raiser should acquaint himself with the habits of the tick and the method of eradication, not only to protect himself, but also that he may be in a position to assist and advise his neighbour.

Eradication of the poultry tick in Queensland will be greatly facilitated by all poultry breeders interesting themselves in the question. The present article is a revision of previous notes by Mr. Rumball, which have already appeared in the "Journal".—ED.

Poultry keeping, which is one of the most valuable adjuncts to general farming, is frequently severely handicapped in many parts of Queensland by the presence of the Poultry Tick (*Argas persicus*). Very little good would be done in trying to explain how the pest was introduced. It is here and has gradually spread over a large expanse of country. In many of the infested areas it is not uncommon to meet farmers who have had their flocks almost depleted, and others who have disposed of their one-time profitable flocks on account of the ravages of this pest. A knowledge of the general habit of the tick, precautions necessary to take against its introduction, and methods of eradication are the means by which poultry may be kept successfully.

PLATE 104 (Fig. 1).—POULTRY TICK AND EGGS.

Hosts.

Fowls appear to be preferred as hosts by the tick, although turkeys, ducks, geese, and pigeons are also attacked. This preference is probably due to the more restful and regular habits of fowls at night than that of other kinds of poultry. Wild birds are also known to harbour ticks. Such infestation has come, no doubt, by the close association with infested poultry yards.

Life and Habits.

The egg of the tick, as shown in Fig. 1, is very small and is of a brownish colour. It is found in the crevices of the woodwork of the houses, perches, and sometimes adhering to feathers, &c. This egg hatches in the course of two to three weeks. Nuttall states the period at from eleven to thirteen days, but probably in cold weather the period is considerably longer.

The young or seed tick, as shown in Fig. 2, has only six legs, white or greyish in colour and very difficult to see. As soon as their covering has hardened they make their way to a host, generally by crawling up the legs of the birds, and attach themselves as shown in Fig. 3. They remain here for a period varying from four to ten days, swelling considerably, and appear as bluish-black spots on the body of the bird.

Fig. 4 shows a young seed tick which has fed and left its host. It has altered considerably in appearance. This seed tick then seeks some secluded spot to rest and moult.

Fig. 5 shows an ideal home for the tick. They will also be found under the bark of trees, cracks in perches, and any similar spot which offers concealment. In searching for the tick one is guided by the darkish spots around cracks in the woodwork of the buildings. These spots are caused by the excreta of the tick. The moulting period takes four to nine days. After moulting the tick presents a somewhat different appearance, having eight legs. It now only feeds at night. The meal is taken rapidly, and long before daylight it is safely hidden away in its retreat. This process is repeated (usually three times) until matured. The adults vary

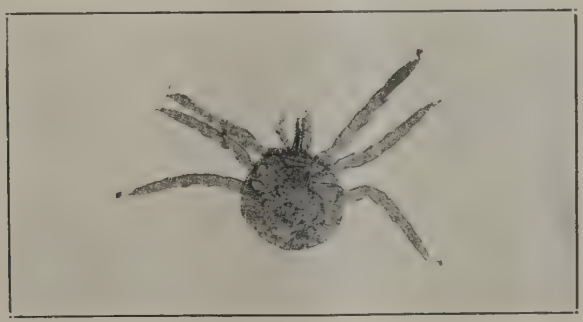

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PLATE 105 (Fig. 2).—SEED TICK BEFORE FEEDING.

considerably in size, large ones being nearly half an inch in length. After another feed the adult female is ready to lay. The poultry tick varies in this respect from the ordinary tick, as she may lay as many as eight batches of eggs of 20 to 100 before death.

Longevity of Poultry Tick.

The fowl tick may have a long life, even when separated from its natural host. Newman, F.E.S., in studying this insect found that a single isolated female lived for two years three months, while in a group one female lived four years and five months. The males were comparatively short-lived. The writer has found ticks thriving in poultry sheds in Queensland where fowls have not been kept for nearly two years. It will, therefore, be seen how impractical it is to merely shut up a fowl-house for a year or so with the hope of extermination by starvation.

Effect on Poultry.

From the foregoing it will be seen that during the day the adult tick is under cover, principally in the roosting quarters, cracks in the timber, nest boxes, old bags, or even between sheets of galvanised iron where it overlaps, and the young or seed tick is attached to the fowl. Its effect on fowls is not confined to the loss of blood. The most serious trouble is caused by the transmission of an actual blood parasite.

Bulletin No. 74, South Australia.]

PLATE 106 (Fig. 3).—SEED TICK ATTACHED TO FOWL.

This parasite induces a fever which either causes the fowl to die or leaves it after a severe illness to recover and become immune to further attacks. This immunity frequently leads farmers to under-estimate the havoc that can be wrought by the poultry tick, and they become indifferent to its presence.

The symptoms of fowls suffering from tick fever are rise in temperature, listlessness, frequently a loss of appetite, restlessness and distress, ruffled plumage, blackness and shrinkage of comb, and some symptoms of paralysis. Diarrhœa is nearly always present, and owners frequently conclude that their birds are suffering from cholera. When these symptoms present themselves, a thorough search should be made for tick.

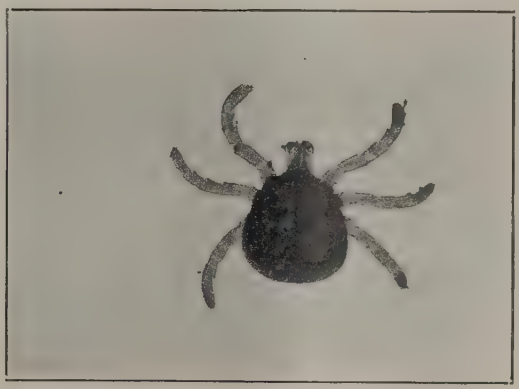

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Plate 107 (Fig. 4).—A Young Tick which has Fed and left its Host.

From Poultry Farming in New South Wales.]

Plate 108 (Fig. 5).—Piece of Old Splintered Wood infested with Fowl Tick.

Combative Measures.

Prevention of infestation should be the aim of poultry keepers who are free of tick. Strict examination and isolation for a period of ten days of all stock purchased assures that when the new birds are placed among the flock they carry no seed tick with them. Burning or spraying will deal with the isolation crate. All crates, egg boxes, or material brought on to the poultry section should be subject to the same rigid examination. Particular care should be given to the examination of crates returned from market, as it is possible that in transit ticks may travel in search of a host from infested crates to clean ones.

The fact that a very little portion of the life of the tick is spent on the fowl, while the infestation of the houses may last for years, naturally causes one to direct his efforts to the treatment of the sleeping quarters of the stock.

Many flocks have no shelter other than trees, and the proper treatment of these is almost impossible. Some of the poultry sheds used are also impossible to treat, every piece of timber being a natural home. Good housing accommodation therefore facilitates eradication. Where the trees and existing infested houses are of no value, a fire is the most economical and effective method of treatment. If the trees are valued for shade purposes they can be securely fenced off and the fowls induced to sleep in the quarters provided.

A start should be made in dealing with infested houses by carefully removing any surplus boxes, boards, and other harbourage, and if of little value make a bonfire of them. When the house is thoroughly cleared of rubbish, spray the entire inside, taking care to get into every crack and crevice, also between the iron where it overlaps. Thoroughly treat all fittings in a similar way, and, in case any ticks have been dislodged and are lying on the floor, give that a spray as well.

The number of sprayings necessary is largely dependent upon the construction of the buildings, and the thoroughness with which the work is done, but three sprayings should always be given at intervals of about five days. These subsequent sprayings will kill any seed ticks that may drop off infested stock from time to time. Where the stock have been accustomed to roost on various parts of the farm it would be well to keep a look-out for the reappearance of the tick for some years, as certain birds laying or roosting away may collect ticks and bring them home to the regular quarters.

Spraying Mixture.

Various spraying mixtures have been tried from time to time, but probably the handiest and one that is very efficient is kerosene emulsion made in the following way:—Take 1 gallon of water, boil in it 1 lb. of good household soap; while hot add 1 gallon of kerosene, stir well until thoroughly emulsified, then add another 8 gallons of water. Use this mixture freely, for it is both cheap and effective.

MT. GRAVATT EGG-LAYING COMPETITION.

The Egg-Laying Competition for 1926-27 terminated on the 31st March, and although no individual or pen score was sensational, the results of many pens and individual birds may be considered highly satisfactory and encouraging to the several owners.

Prize list:—

SECTION 1.

Pen of Six Hens.

	Score.
First—J. J. McLachlan	1,472
Second—P. A. Gooch	1,462
Third—	
Mrs. R. E. Hodge	1,432
R. C. J. Turner	1,432

Winter Test.

(Highest number of eggs laid by pen from commencement of test until 31st July):—

First—E. V. Stuckey	483
Second—S. L. Grenier	465

Single Hen.

First—J. J. McLachlan	279
Second—Mrs. R. E. Hodge	278
Third—J. E. G. Purnell	277

SECTION 2.

Pen of Six Hens.

First—E. Walters	1,464
Second—W. H. West	1,456
Third—Jas. Hutton	1,392

Winter Test.

First—E. Walters	491
Second—W. D. West	479

Single Hen.

First—H. Cutcliffe	289
Second—Jas. Hutton	277
Third—W. D. Melrose	274

The following are the individual results from the 10th April, 1926, to 31st March, 1927:—

SECTION 1—Light Breeds.

Name.	A.	B.	C.	D.	E.	F.	Total.
J. J. McLachlan	180	226	275	239	273	279	1,472
G. Pitt	271	265	213	199	253	265	1,466U
P. A. Gooch	250	250	250	235	219	258	1,462
Mrs. R. E. Hodge	254	255	240	206	199	278	1,432
R. C. J. Turner	246	260	243	212	195	276	1,432
W. and G. W. Hindes	248	247	175	258	244	237	1,409
J. E. G. Purnell	169	207	208	278	268	277	1,407
E. V. Stuckey	231	200	256	187	259	271	1,404
M. F. Newbury	238	230	234	253	250	197	1,402
S. L. Grenier	218	223	247	199	246	249	1,382
J. Columbine	228	236	200	224	245	233	1,366
G. Brasch	202	200	234	243	258	189	1,356U
W. Wakefield	242	157	226	233	255	230	1,343
W. E. Woodwood	262	234	229	248	232	134	1,339
Sunrise P. Farm	270	255	165	197	211	228	1,326
A. W. McMurtrie	181	259	246	253	202	179	1,320
Geo. Marks	181	247	182	248	266	190	1,314
J. Earl	239	195	260	228	196	183	1,301U
L. Anderson	259	241	248	189	187	167	1,291
H. T. Fraser	177	156	184	251	225	273	1,266
J. Harrington	209	225	214	220	157	221	1,246
E. W. Ward	230	241	144	212	171	246	1,244
B. Driver	217	259	140	250	165	203	1,234
G. Hanlon	229	192	221	234	70	250	1,196
A. S. Walters	235	123	191	215	251	162	1,177
H. P. Clarke	187	238	211	188	165	165	1,154
W. J. Boston	159	221	224	252	270	..	1,126
G. W. Cox	223	158	219	102	238	183	1,123U
T. H. Craig	259	175	209	191	119	162	1,115
J. Franklin	145	178	142	214	189	241	1,109U
H. Cutcliffe	158	230	246	169	142	164	1,109U
M. F. Marsden	195	160	218	94	180	193	1,040
R. M. Moore	148	106	155	41	138	113	701

SECTION 2—Heavy Breeds.

E. Walters	256	232	277	229	242	228	1,464
W. H. West	227	271	245	236	237	240	1,456
J. Hutton	257	223	277	150	220	265	1,392
Mrs. Gallagher	234	273	198	231	235	210	1,381
J. Potter	229	231	243	229	235	183	1,380
H. Cutcliffe	247	257	202	168	289	201	1,364
J. Columbine	158	247	257	234	214	234	1,344
Eclipse P. Farm	189	287	165	223	278	193	1,335
Mrs. Potter	201	191	224	264	191	240	1,311U
W. T. Jones	288	206	195	176	174	261	1,300U
W. R. Wilson	241	235	176	223	166	224	1,298
G. Rogers	202	186	193	242	235	217	1,275
W. and G. W. Hindes	203	259	215	164	223	144	1,208U
R. Burns	152	193	233	199	239	184	1,200
J. J. McLachlan	198	238	163	195	214	183	1,191
W. J. Smith	192	236	203	194	135	231	1,191
P. A. Gooch	175	256	206	146	154	218	1,155
W. D. Melrose	155	189	68	163	261	274	1,110U
E. A. Smith	196	181	209	154	172	117	1,029
H. C. Thomas	241	153	130	112	128	187	951
E. C. Stead	206	177	138	154	126	145	946
E. W. Ward	131	170	172	144	158	114	889U

"U" indicates that the average weight of eggs per dozen was under the standard of 24 ounces.

ANIMAL NUTRITION.

WITH SPECIAL REFERENCE TO MAINTENANCE IN DRY SEASONS.

By N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

Since the whole of the nourishment to sustain life and to build up the bodies of all animals is derived from the food and water they consume, it follows that, in the case of herbivorous animals, the quality of the food supplied as pasturage or otherwise should be a matter deserving the closest attention of the stock raiser.

All graziers are aware, from practical experience, that the many different kinds of grasses, legumes, and herbage that occur to form the pasturage on every holding throughout the State, vary in palatability and food value at different stages of their growth, some being palatable only in early growth, becoming rapidly unpalatable after flowering, others becoming palatable after the flowering period is reached, whilst others, comparatively few in number, are more or less palatable at all stages of their growth. Palatability thus referred to is that naturally existing when selection is possible, for through scarcity or other causes an appetite may be developed for growths previously distasteful, and in some cases for those that prove injurious, such as Zamia. The value of a plant in the pasturage lies in its palatability and digestible nutrient content, the measure of the former being frequently an index to the degree of the latter. A good illustration may be seen in the rapid advance made by stock when feeding on young succulent pasturage, as compared with the same pasturage at a later stage of growth.

What Analyses Reveal.

Analyses of plants and animal bodies, as is to be expected, reveal the presence of the same elements in each, though not in the same relative proportions or in exactly the same conbinations, consequently an understanding of the quantities of these elements in daily requirement by the animal for growth, fattening, milk production, &c., or maintenance in good health in any season must be of great assistance, if not essential to success, in every branch of animal husbandry.

The elements combining to form the structures of plants and animals are carbon, hydrogen, oxygen, nitrogen, sodium, potassium, phosphorus, calcium, magnesium, sulphur, iron, silicon, fluorine, and chlorine. As previously remarked these elements do not exist in the same relative proportions on the two types, animals usually containing more nitrogen and phosphorus than plants, while certain of the other elements only occur in very small quantities, in some cases being confined to the fluids and juices, where their presence is doubtless necessary for the performance of various functions.

The more important chemical compounds found in plants and animals are classified as:—Nitrogenous compounds, or crude proteins, carbohydrates, fats or oils, mineral salts or ash, and water. Excepting water, these are regarded as groups in which largely the same chemical elements are combined, but not necessarily in the same proportions. The fat or oil of a plant is never identical with that of an animal, and the oils of various plants, such as olive or castor oil, are as different as butter and suet, yet they are all fats. Sugar and starch are each composed of carbon and water, yet in different combination, and are both carbohydrates. Similarly the proteins or albumenoids, which are included in the nitrogenous compounds of plants, are not identical with those of animals, but are composed of the same elements.

Proteins are the nitrogenous compounds, or compounds in which nitrogen is the most important element; of the plant proteins about 16 per cent. is nitrogen. In addition to this element proteins are composed of carbon, hydrogen, and oxygen, and also contain small quantities of phosphorus, sulphur, potassium, and the other mineral salts mentioned. White of egg, lean meat, and the casein of milk are examples of practically pure proteins. Blood, muscles, and nerves not only consist largely of protein, but require it in the food of the animal to make good the wear and tear of life, and to provide for growth and development. Just as nitrogen is an essential element in the food of plants, in the form of ammonia, so it is an essential element in the food of animals, in the form of protein.

Carbohydrates are compounds composed of carbon, hydrogen, and oxygen, or carbon and water, as the proportion of hydrogen to oxygen is always 2 to 1, as in water. Sugar and starch are common examples which, with certain other related products, constitute the greater part of all dry plant substances.

Fats or Oils are similar to carbohydrates, being composed wholly of carbon and water, but are classified differently, owing to the proportion of carbon being so much higher. In expressing the value of these as carbohydrates, the percentage in the analysis is multiplied by 2¼, as it is held an equal quantity is so much more heat-giving than of ordinary carbohydrate, such as starch.

The province of the carbohydrate in the food is not only to assist in the building up of the frame, but to provide the energy and heat of the body.

Mineral Matter or Ash is the residue obtained when the plant is burnt, and is termed the inorganic matter. Except for such matter as may have been lodged on the plant, as dust or mud, inorganic matter is a misnomer, since the elements have been taken into the plants in a solution in the same manner as the elements of the volatile compounds that passed off in burning. Mineral matter is found in all parts of the animal's body, especially the frame, and is as necessary for perfect health and development as other forms of food.

As a general rule most fodders provide all the mineral matter required for growth and maintenance when fed in suitable rations, so it is rarely considered in the calculations of foods to provide a required nutritive ratio. There are times, however, when mineral matter is in insufficient supply, in which case it is either supplied with the food or as a lick, reference to which will be made later on.

Digestible Nutrients.—Of the totals of crude protein and carbohydrates, including fats, obtained in the analysis, not all are entirely digestible, hence, in order to obtain the true nutritive values, the digestible amounts can only be considered. By careful feeding tests in which the food and excrements therefrom were carefully weighed and analysed, the actual amounts digested and made use of were arrived at. Numerous such tests with different classes of animals at various ages with many different fodders allowed fairly accurate estimations of the proportion of digestible nutrients to be obtained; a coefficient of digestibility was thus secured for very many fodders, which could be applied to others of similar character.

Nutritive Ratio.—The relative proportions of digestible crude protein to combined digestible carbohydrates and fat is termed the nutritive ratio, and expressed as one part of proteins to so many parts of carbohydrates. In combining digestible carbohydrates and fat for this purpose, the percentage of fat is multiplied by 2¼ and added to the carbohydrates, the total then being divided by the percentage of digestible crude protein. As an example, lucerne hay is shown as averaging a content in digestible nutrients of 10.6 per cent. crude protein, 39 per cent. carbohydrates, and 0.9 per cent. fat. Multiplying 0.9 by 2¼ the result is 2.025, which, added to 39, gives a result of 41.025; this divided by 10.6 results in 3.87, which is near enough to be stated as 3.9. So the nutritive ratio of lucerne hay would be set down as 1:3.9. This is termed a narrow nutritive ratio. An example of a very wide nutritive ratio will be seen in the analysis of wheaten straw, which is given as containing in digestible nutrients 0.7 per cent. crude protein, 35.1 per cent. carbohydrates, and 0.5 per cent. fat. Working out in the same manner as shown in lucerne hay, the nutritive ratio is found to be 1:51.7. A nutritive ratio as wide as this might be expected in many pasture grasses that have shed their seed.

Scientific Feeding.

Balanced Rations.—Scientific feeding tests have demonstrated the necessity for the supply in the daily ration of particular quantities of digestible proteins and carbohydrates in relative proportions, varying according to the use to which the animal is put. Thus the ratio of protein to carbohydrates will alter for the young, growing animal, the mature animal yielding milk, the animal fattening, the animal doing work, as in the case of the horse, and the animal at rest, while the quantities of each to be supplied in the daily ration will be influenced by its size or weight.

Desirable nutritive ratios as set out in late compilations of feeding standards range roughly from 1:4 to 1:6 for animals yielding milk and young animals growing and fattening; from 1:6 to 1:8 for fattening mature animals and for horses at work; and from 1:8 to 1:12 for animals at rest or for maintenance. When the animal is fed with an ill-balanced ration, that is, when the ratio of protein to carbohydrates is narrower or wider than that required, waste occurs, for only those portions necessary are used, *e.g.*, if in feeding the ration called for is 1 part protein to 6 parts carbohydrates, and a feed containing 1 part to 16 is supplied, it follows that a greater quantity must be consumed to obtain the necessary protein, with consequent wastage of the carbohydrates not required. This is an example of a wide ratio, such as occurs in many grass hays. A narrow ratio is such as lucerne before bloom, which is expressed as 1:2 to 1:3, in feeding which a waste of protein would occur.

With this understanding the economy of a properly balanced ration is apparent.

In all animals, and more especially in ruminants, a certain amount of distension is necessary to ensure proper digestion. Concentrates, such as grains, meals, and oilcakes, can provide the requisite amount of both proteins and carbohydrates, but

roughage, in the form of grass, chaff, or hay, is a necessary adjunct in giving the necessary amount of dry matter set down, while in ruminants the grass or hay is further necessary to assist in the regurgitation of the food when chewing the cud. An excellent publication dealing very fully with all matters pertaining to animal nutrition, together with analyses of a multitude of foodstuffs, and tables of feeding standards, will be found in "Feeds and Feeding," by Henry and Morrison, which is regarded as the standard text-book on the subject, and from which all copies of analyses herein given have been extracted. A study of this book, which should be in the hands of every stockowner, will give a better understanding of the conditions under which the best success in animal husbandry can be attained.

Pastures.

Pasturage Values.—The analyses of pasture grasses at different stages of growth show a widening of the nutritive ratio from as low as 1:3 in the very young growth to 1:16 and wider when the same grass is matured and old. In the case of legumes, the same widening of the nutritive ratio does not occur, as that ranges from 1:2 to 1:6, and only in rare instances to 1:7, for which reason their value is apparent.

All graziers have noted the beneficial effects of pasturage in young growth on their stock, in growth, fattening, and milk production, which were less marked when that same pasturage had grown older. While the young succulent growth, being laxative, would act medicinally after stock had previously been feeding on dry feeds, the rapid advance cannot be attributed to other than the greater nutritive properties reflected in the desired proportions of proteins to carbohydrates prevailing at the stage of growth.

In a study of the life history of a plant, it is found that the first efforts are concentrated on establishment and enlargement; at this period all the elaborated material, as fast as formed, is transferred to the growing parts, that they may be built up and established. As the plant approaches maturity its energies are changed from growth to reproduction; first come the blossoms and then the young enlarging seeds or fruit, in which is transferred much of the sugars and proteins, with certain mineral matter in a very concentrated form that were previously, to a large extent, diffused throughout the plant. It will thus be seen that the mass of the plant, stems, branches, and leaves, possesses, in itself, greater nutriment before seeds are formed, and very much less when those seeds have matured and fallen off.

While the grass is in early growth the nutrients contained therein are easily digested; as the plant grows, the woody fibre, analogous to the skeleton of animals, increases and hardens, and the digestibility of the contained nutrients becomes lowered, while in palatability the plant, usually very acceptable in the young growth, becomes less and less so as it grows older, until, in some cases, it becomes distasteful.

The low value of the pasturage, when old, is therefore due to the preponderance of carbohydrates and the lowering, to a great extent, of the proteins that were present in its early growth. Where legumes, in any stage of growth, are present in quantity, the necessary proteins would be supplied; their absence, in most pastures, can be held responsible for the failure of stock to do well on dry pastures at any time.

Feeding in Dry Times.—In dry seasons, when there is sufficient dry grass to supply the necessary carbohydrates, the feeding of a food rich in protein is indicated in quantity greater or less according to whether progress or maintenance is required. This could be supplied by a legume hay, such as lucerne, cow pea, velvet bean, &c., or by a concentrate, such as linseed, peanut, or certain other oilcakes, seeds of beans or peas or even some slaughter-house by-products, such as meatmeal, &c., which stock will sometimes take to.

In very dry seasons, when the pasture is in insufficient supply or is so old and indigestible as to be regarded as almost valueless, a call is made for a food supply containing the full amount of nutriment necessary. This could be supplied in grass hay, if made when the grasses contained their full food value. Hay from the legumes, and ensilage, or mixtures of either, while concentrates, such as mentioned previously, or grain, such as maize, or seeds of beans and peas could be added.

A Basic Ration.

Maintenance Rations.—A ration may be described as the amount of food that is to be fed to an animal during the day of twenty-four hours, whether fed all at once or in portions at different times during that twenty-four hours. A maintenance ration would be one that would furnish sufficient but not more of each nutrient than is necessary for maintenance, so that it will neither gain nor lose weight.

The quantities of proteins and carbohydrates considered necessary for maintenance have been worked out for various farm animals, and are set out in several tables of feeding standards, of which those of Wolff-Lehmann are perhaps the most widely known.

It may be interesting to know that the first of the tables of feeding standards was published by Dr. Wolff, a German scientist, in 1864, and that these appeared annually in the Mentzel-Lengerke Calendar, with such occasional modifications as were indicated from the results of research work until 1896, when Dr. Lehmann, of the Berlin Agricultural High School, became associated with their production, with further modifications until 1907, since which they have been subjected to still further modifications up to the present. Other tables of feeding standards, such as Armsby's and Kellner's, have been arrived at from different scientific viewpoints, but there is no very great diversity between the standards laid down in any of the later tables published.

These feeding standards were compiled from data obtained in cold, or at best temperate, climates and are held there as only approximately correct. In tropical or sub-tropical climates further modifications might possibly be found necessary, but not, it is thought, in an increase of the quantities to be fed daily.

Feeds and Feeding.

In "Feeds and Feeding" the authors publish a table of modified Wolff-Lehmann feeding standards, which they have compiled after consideration of the results of recent scientific work in live stock feeding.

The amounts as set down for 1,000 lb. live weight of the different animals to be fed for maintenance daily are: —

—	Dry Matter.	Digestible Crude Protein.	Digestible Carbohydrates.	Nutritive Ratio 1.
	Lb.	Lb.	Lb.	Lb.
Cattle	13·0—21·0	0·6—0·8	7·8—9 6	10·0—16 0
Sheep	20·0—26·0	1·4—1·6	10·6—12 4	7·5—8·0

Naturally, in the feeding tests, under which these quantities were decided upon, the animals were maintained in the same good condition in which they started throughout the test.

It is generally known that an animal can maintain health and a certain amount of strength on a starvation diet, provided water is in sufficient supply, by calling on the reserves built up within the body, for such time as those reserves will last, so that to bring an animal through a dry period alive and healthy, accurate feeding of the amounts set out, though desirable, is not absolutely essential, provided the animal was in good condition at the start.

It will be observed the amounts set are for animals per 1,000 lb. live weight, so that in making calculations for maintenance the average weight of the animals in store condition must be taken as so many thousandths of the amount required. For example, if a bullock is estimated as of 500 lb. live weight, then five hundred thousandths, or one-half of the amounts indicated, would be needed. If the average live weight of merino sheep in store condition was taken at 50 lb., then one-twentieth is indicated as the minimum for each animal.

In feeding foods of poor quality the capacity of the animal has to be considered, for if, to obtain the necessary amount of a particular nutrient, such as protein, a quantity larger than the animal can conveniently consume is indicated, it would be imperative to reduce that amount, and to add a concentrate or other food rich in the desired direction.

The labour in supplying daily the amount of food necessary is also a matter for consideration.

The capacity of a bullock is approximately eight times greater than that of a sheep, so that reasonable limits for the consumption of dry roughage, such as hay, might be set down as 20 lb. and 2½ lb., respectively, each day—amounts which would be held as impossible to supply economically to any large number, and which stress the desirability of fodders being conserved with their highest nutrient content.

In most cases the call for fodder supply will be to supplement the existing dry pasture, in which there would be sufficient dry matter and carbohydrates, but a deficiency in protein.

Where there was no pasturage available, the quantities of dry matter, protein, and carbohydrates would need to be supplied.

The following analyses may be taken as substantially correct for such foods as can be conserved on the holding, or which may be purchased as a supplement:—

—	Dry Matter.	Crude Protein.	Carbo-hydrate.	Fat.	Nutritive Ratio 1.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*Mitchell grass hay ..	88·0	3·0	46·37	0·7	15·9
*Flinders grass hay ..	88·0	3·3	43·45	0·5	13·5
Good bush hay	92·5	2·8	46·6	0·6	25·2
*Sudan grass hay	85·0	5·8	43·7	0·4	7·7
Liberty millet hay ..	85·7	5·0	46·0	1·8	10·0
*Jap millet	85·0	3·5	51·2	1·06	15·3
Cow pea hay	90·3	13·1	33·7	1·0	2·7
Velvet bean hay	92·8	12·0	40·3	1·4	3·6
Lucerne hay	91·4	10·6	39·0	0·9	3·9
Lucerne, green	25·3	3·3	10·4	0·4	3·4
Sorghum ensilage	22·8	0·6	11·6	0·5	21·2
Linseed oil cake	90·9	30·2	32·6	6·7	1·6
Peanut oil cake	89·3	42·8	20·4	7·2	0·9
Cow pea seed	88·4	19·4	54·5	1·1	2·9
Velvet bean seed	88·3	18·1	50·8	5·3	3·5
Sorghum grain	87·3	7·5	66·2	2·6	9·6
Maize	89·5	7·5	67·8	4·6	10·4
Kafir grain	88·2	9·0	65·8	2·3	7·9
Feterita grain	89·2	9·3	66·6	2·5	7·8
Kaoliang grain	90·1	8·5	67·0	3·3	8·8

*These hay values were calculated from the analyses of the green materials.

Examining the analyses of the hays it will be found that they are all high in dry matter content, so we may dismiss consideration of the supply of that as unnecessary.

What amount, therefore, will be advisable of proteins and carbohydrates, respectively, in the ration each day for the maintenance of cattle averaging 500 lb. weight, or of sheep averaging 50 lb.?

Referring to the quantities previously set out, we will find half of that designed for the 1,000 lb. ox will be 0.3 to 0.4 lb. protein and 3.9 to 4.8 lb. carbohydrates, while for the 50 lb. sheep, one-twentieth of that for 1,000 lb. weight, will be .07 to .08 lb. protein and .53 to .62 lb. carbohydrates.

To find the amount of fodder to supply a specified quantity, a simple sum in proportion is required, *e.g.*, 100 lb. bush hay contains 2.8 lb. crude protein, what amount will be required to give 0.3 lb? $(100 \times 0.3) \div 2.8 = 11$ lb. roughly. Thus 11 lb. bush hay will give 0.3 lb. protein, but how much carbohydrates? One hundred pounds bush hay gives 46.6 lb. and 0.6 lb. fat, which latter is multiplied by $2\frac{1}{4}$, and the result added to the carbohydrates to make a total of their full value; thus $46.6 + (0.6 \times 2\frac{1}{4}) = 47.95$, say 48. Then if 100 lb. yields 48 lb., what will 11 lb. give? $(11 \times 48) \div 100 = 5.28$ lb.

So if we feed 11 lb. bush hay to a bullock, we will supply the .3 lb. protein demanded and 5.28 lb. carbohydrates, which latter is 1.38 lb. more than required, and which would be wasted when fed.

Working in the same manner, we find that 3 lb. of lucerne hay would yield .3 lb. protein, but only 1.23 lb. of carbohydrates, which is 2.67 lb. less than required. To supply the quantity for 3.9 lb. carbohydrates, $9\frac{1}{2}$ lb. of hay will be required, entailing a loss if fed of enough protein to do two more animals.

Obviously, a mixture of the two feeds would provide the most economical ration. Thus:—

1 lb. of lucerne hay will give .1 lb. protein and .41 lb. carbohydrates.

7 lb. of bush hay will give .196 lb. protein and 3.36 lb. carbohydrates.

The total nutrients of this mixture would be .296 lb. protein and 3.77 lb. carbohydrates, which is very close to that required.

As there will always be some dry grass available, such a mixture could be calculated as just sufficient for the maintenance of a beast of about 500 lb. weight.

As very dry pastures have a very low protein content and comparatively high carbohydrate content, the graziers' concern would be to supply the necessary protein, which would be more easily effected with 3 lb. of a legume hay than with 11 lb. of bush hay. For sheep, it will be noted the protein required is proportionately greater than for cattle, largely owing to the amount of protein demanded for the production of wool—which, freed of moisture, grease, and dirt, is practically pure protein.

To supply the necessary protein, .07 lb. daily, for the 50 lb. sheep, it would be necessary to supply 2½ lb. of bush hay, or .66 lb., which is 10½ oz., of lucerne hay, or .24 lb., which is roughly 4 oz., of linseed oil cake. This quantity of bush hay would give 1.2 lb. carbohydrates, which is .67 lb. more than is required; the lucerne hay would give .27 lb., about half the requisite quantity, while the linseed oil cake would give .12, or a little less than a quarter of that required.

As was shown in the case of cattle, more economical feeding would result with a mixture of a food rich in protein added to a smaller quantity of bush hay. Thus 1 lb. bush hay yields .028 lb. protein and .48 lb. carbohydrates, 6½ oz. lucerne hay yields .042 lb. protein and .16 lb. carbohydrates, so that the mixture would yield .07 lb. protein and .64 lb. carbohydrates. The 6½ oz. of lucerne hay providing .042 lb. protein could be substituted by 2¼ oz. linseed oil cake, 1⅜ oz. peanut oil cake, 3⅜ oz. cow pea or velvet bean seed, 9 oz. maize, 8 oz. grain sorghum, and so on, though with some of these the carbohydrate content of the mixture would be slightly higher than was necessary.

The quantity of conserved fodder to carry over a specified number of stock for a stipulated time can be worked out approximately from these figures. Assuming 4,480 sheep were to be fed, the daily requirements of bush hay would be 2 tons, of legume hay 1,820 lb., which latter could be substituted by 630 lb. linseed oil cake, 448 lb. peanut oil cake, 1,008 lb. legume seed, 2,520 lb. maize, or 2,240 lb. sorghum grain.

For a possible feeding period of 200 days stacks of bush hay, aggregating 400 tons at 20s. per ton, and of legume hay, aggregating 163 tons at £2 per ton, would be necessary, a total cost of £726, to which must be added the cost of distributing to the stock. Allowing 17s. 6d. per day for an extra man, the cost for 200 days would be £175, making a total of £901, or 4s. per head, which is a reasonable figure for the cost of feeding a sheep for 200 days.

The quantity of fodder thus indicated will appear very large, especially if a greater number of sheep had to be provided for. It would not be necessary to conserve this quantity every year, nor would the period over which feeding would be advisable, except very rarely, extend as long as 200 days. A certain amount stored annually would soon aggregate sufficient to provide for any period of exceptionally light rainfall.

The cattle-owner will, doubtless, decide that it will not be economically possible to conserve and feed hay to his herd in a dry time, since where hundreds of tons are required for sheep, thousands would be required for cattle. With cattle particularly, the drought losses fall most heavily on the breeders. On most runs the frontages to water are soon eaten out, requiring a greater distance to be travelled daily to water as the pasturage is eaten further back; the weaker animals, feeling the strain of the journey to water, allow longer intervals between drinks, which further weakens them, resulting frequently in their inability to free themselves from the soft or boggy soil at the water's edge after drinking, where they perish.

While it would not be feasible to provide fodder for the whole of a large herd of cattle, the profitability of a supply to the breeders segregated within a reasonable distance of water should be worthy of serious consideration.

Fodder Values.

Digestibility of Fodders.—Where the proportion of proteins to carbohydrates forms a suitable nutritive ratio, digestion is more easily effected than when either preponderate; while excess of carbohydrates means a poorer digestion and loss of the excess of that nutrient in the fæces, an excess of protein fed for a length of time is apt to impair the health of the animal, as well as preventing full assimilation of the nutrients demanded.

Where the fodders supplied contain a high proportion of woody fibre, such as in old dried up pastures, digestion is interfered with, while the slower passage of this undigested matter through the bowels lessens the capacity of the animal for further food, to such an extent that though sufficient nutrients may be present, the quantity necessary to supply same is greater through this cause than the animal can consume

daily. An aggravated condition due to an excessive quantity of indigestible matter in dry foods is termed dry bible or impaction of the omasum, in which the digestive tract becomes paralysed, and death ensues if relief is not given.

Succulence.—The greater progress of animals feeding on young succulent pastures than on those more matured is due, not only to the better balance of the nutrients, but to their succulence and easier digestibility, which allows a greater quantity to be consumed daily with a consequent assimilation of greater nutriment. Succulence in a food, especially in a dry time, renders it more appetising.

Silage.—The value of silage lies not only in the food value it possesses but in its succulence. The analysis given of sorghum ensilage shows a wide nutritive ratio, indicating the addition of a fodder rich in protein to obtain the best results from feeding. Silage made from a mixture of sorghum and cowpeas or velvet beans should give a more satisfactory balance of nutrients. As the sorghum silage analysis shows a moisture content of 67.2 per cent., it necessarily follows that a greater quantity must be fed daily than is suggested in hays or other dry fodders, where the moisture content is 15 per cent. or lower. The great value of silage is in its succulence, through which digestion is assisted and the appetite increased. Sheep-breeders are aware of a higher lambing percentage when the pastures have a certain succulence than when they are dry, also of the better progress of ewe and lamb when this same succulence obtains.

In the North-Western sheep areas it is rarely that the pasturage is good both at the time of joining ewes and rams and when the lambs are dropped; consequently, mating is usual between September and November, when the pastures are at their worst, so that the lambs will appear between February and April, when the pasturage is most certain to be good. Joining during these dry months does not result in as high an average lambing percentage as is desired. Flushing the ewes by feeding to them silage with other nutritious fodder some few weeks before joining with the rams could be expected to result in a more successful breeding over a shorter period, while the better nourished animals should produce stronger and better lambs.

An additional value of silage would be found in an occasional supply to ailing sheep or those that were not doing well on other fodders, such as are usually set apart in dry times in the "hospital paddock."

Change of Diet.—As with the human being, change of diet is appreciated by animals, a better progress being maintained when the fodders are from a mixture of plants than from one or two only. Occasional changes, while still maintaining the supply of the necessary nutrients, will act as a stimulus to appetite.

The choice of the grazier will be limited, unless purchase is made, to those crops which can be profitably grown on the holding. While bush hay, from its ease of production, can be expected to provide the bulk of the fodder, legume hay should also be conserved to provide in combination the desired nutritive ratio in a ration not too large, for easy supply or for the capacity of the animal. In addition, silage from its succulence, is very valuable, while the seed of cowpeas or velvet beans, and the grain of sorghums, should be especially useful by way of change or for use when flushing ewes.

The feeding standard for the maintenance of cattle and sheep at the weights indicated must only be looked upon as approximate. Animals of the same size or weight can be expected to vary in their power to assimilate nourishment from the same quantity of food.

Since the chief deficiency in dry pasturage and grass hays is protein, the aim in feeding should be principally directed to its supply, of which the amount set out as the daily requirement should not be lessened. Where work beyond the maintenance of the animal is demanded, such as in the production of milk or the nourishment of the fœtus, a greater supply of nutrients, especially in proteins, is necessary, towards which silage, legume seeds, linseed oil cake, and grain offer advantages.

MINERAL REQUIREMENTS.

As previously mentioned, the requirements of an animal in mineral matter are, in most localities, sufficiently met by a good, mixed pasturage or other fodder, in which the necessary amounts of digestible nutrients are contained. The composition of the ash of various plants, however, differs somewhat when grown under equal conditions of soil and climate and during stages of growth, while there are further differences in that of the same species when grown on soils of unequal fertility, and in good and bad seasons, for which reasons mineral matter is sometimes deficient in the feed. Cattle raisers are all aware of better bullocks, not only in size and quality of beef, but in earlier maturity, being raised in one district than in

another, while sheep men can instance higher prices being secured for wool produced in one particular district over that produced by sheep of similar breeding in another district.

The composition of the ash of plants, though containing the same elements, differs in the proportion of these elements from the ash of animals. The percentage of ash in the animal will vary according to its age and condition, the amount of mineral matter in the bones or skeleton being proportionately much greater than in the other parts; so that the percentage of ash decreases as the animal fattens.

According to Lawes and Gilbert, of the Rothhamstead Experiment Station, England, a bullock half fattened contains 4.66 per cent. of ash, while a fattened bullock contains 3.92 per cent. ash; similarly a store sheep will contain 4.36 per cent., while a fat sheep will contain 3.45 per cent. This ash will contain lime, phosphoric acid, potash, soda, magnesia, silica, iron, &c., of which some 80 per cent. will be comprised of lime and phosphoric acid, in the approximate proportions of 41 and 39 parts, respectively, while potash will represent about 4.8 per cent., soda about 4.5 per cent., magnesia about 1.4 per cent., with other constituents in lowering quantities to a trace. The preponderance of lime and phosphoric acid is due to the bones being very largely composed of these, in combination as a calcium phosphate. The necessity for the supply of these mineral substances is thus very apparent; it is not only in bone formation, however, that their presence is essential, for, in common with the other mineral elements found in the animal's body, the vital processes cannot satisfactorily go on in their absence.

Lime and phosphoric acid forming, as they do, some 80 per cent. of the mineral matter of the animal's body, necessarily are required in greater quantity in the food. In some districts, notably those where stock thrive best on the natural pastures, the soil supply is sufficient to allow the requisite amounts to be obtained in the pasturage; in others, however, phosphoric acid and lime are in poor supply, when the shortage of one or both is reflected in a smaller size of the matured animal, longer period in reaching maturity, or in malformation of the bone, brittle bones, and, in general, loss of tone and vigour.

Instances of the difference in the mineral content of plants can be cited in the excess of lime in legumes over non-legumes, and in the layer proportion of phosphorus in the seeds of cereals, &c., showing in the latter a loss of phosphorus from the plant when the seed has been shed.

While animals obtain mineral matter from their food, they also find a source of supply, frequently in the water they drink. An instance of the value of dissolved mineral matter in the drinking water was reported as far back as 1878, in the Austrian "Quarterly Review of Veterinary Science," where cattle suffered from fragility of bones and general unthriftiness when drinking from a spring of pure water, but when supplied from a second spring, which contained in solution carbonate, sulphate, and phosphate of lime, as well as chlorate of magnesia, though only in small quantities, the animals recovered; being changed back to the pure water, the trouble reappeared, to disappear again when the mineralised water was next brought into use. It was noted that stock partook more freely of the mineralised water than they did from the pure stream.

Mineral Craving.—The deficiency of one or more of the necessary constituents in an animal's food creates a craving through which the appetite becomes perverted, allowing substances to be consumed that normally would not be touched, an example of which is bone chewing. Instances of natural licks are not uncommon in cattle country, where, over a number of years, cattle consuming the earth at particular spots have made appreciable excavations. Analyses of the earth from these spots have revealed small quantities of lime, magnesia, potash, &c., which, no doubt, was the incentive for the licking of the soil at those spots. On the coastal country, cattle eating species of the zamia plant—burrawong in New South Wales and zamia in Queensland—develop a disease commonly known as rickets. In the early days of settlement this trouble was unknown, but the habit of eating portions of the plant gradually spread, until cattle affected with rickets caused thereby are now common in districts where the plant grows freely. A pastoralist relates that on a holding in the Mackay district there was no trouble until 1888, a very dry year, when the cattle took to eating the zamia and have been following the practice since, with consequent prevalence of rickets. In very dry years stock eat many growths that in ordinary seasons they will not touch, although there may be plenty of dry grass available. Such an appetite is evidently caused by a craving or demand of the system for something wanting in the pasturage, especially during extra dry periods.

While a perverted appetite, in odd instances, may be created by another cause, it is considered that the craving caused by a deficiency of one or more of the

necessary mineral elements in the food must be held as responsible. Weight is lent to this view from the fact that, where mineral matter in the form of a lick is provided, stock partake of it less freely, if at all, when the pasturage is young and mineral content good, but more and more freely as the pasturage becomes older or in times of drought, when it is known the mineral content is in lowest supply.

Deficiencies of mineral matter in the pasturage or other fodder grown on the small cultivated holding are met by the application of fertilisers to the soil, a system that offers no attraction on the large pastoral holdings.

The addition of mineral matter to the food has proved very effective in feeding tests, but this also is impracticable on the large holding.

A supply through the agency of the drinking water is only possible where stock obtain their supply from troughs. Here the necessity to use a water soluble phosphate would add to the expense, while, at the same time, waste would occur, in the animal being forced by thirst to imbibe more than the system demanded. It remains, then, for consideration to be given to a means whereby the animal can obtain a supply, as it feels the need, in which connection a mixture of the necessary matter with an attractive base is suggested.

Licks and Their Values.

Licks.—It has been customary for ages past to supply horses, cattle, and sheep with salt, in the form of a lick; pure salt is a combination of sodium and chlorine, both of which are found to be contained in the body of the animal, the former expressed as soda forming something like 4.5 per cent. of the ash, while the latter is found in considerably less quantity than 1 per cent.

Salt alone cannot be regarded as supplying the most necessary of mineral matter; rather may it be viewed as a condiment, which increases the palatability of many foods, and as an aid to digestion. The appetite for salt varies with the season, and also on different classes of country. Scientists have disagreed as to the measure of importance in which the supply of salt should be regarded, but all admit a certain amount is beneficial. Excessive consumption of salt is injurious, and at times proves fatal.

In the form of a lick, where stock can help themselves, a nausea is created before too much is taken, and it is only where a mixture is made with a food sufficiently palatable to defeat the nausea otherwise obtaining that an excess is taken, and harm results. As a base for a lick, in which other mineral matter can be supplied, the attraction of salt commends it.

The analyses of the ash of animals would suggest the supply of the mineral substances which occur in largest quantity therein, such as lime and phosphoric acid; a combination of these as a calcium phosphate, either as phosphate rock or as sterilised bone, of course ground up finely, offers the most satisfactory and economical means of supply.

Licks composed of calcium phosphate and salt have proved very beneficial, and have been effective in overcoming brittleness of bone and other evils, due to a lack of these mineral matters in the soil, and consequently in the pasturage grown thereon. Henry, in an informative article on "The Influence of the Mineral Constituents of Food on Animal Health," in the New South Wales "Agricultural Gazette," for December, 1925, points to the supply of lime and phosphorus having a beneficial effect on reproduction, as well as in countering other ill effects, due to their deficiency in the soil.

Other mineral matter found in the bodies of animals, such as potash, magnesia, iron, and sulphur are not usually added to a lick in any quantity; all fodders generally containing sufficient for the animal's requirements.

Sulphate of iron, which has tonic properties, is generally advised in the proportion of 1 to 2 per cent.

Potash, though rarely appearing in the formulæ for stock licks, might be given consideration in those specially compounded for sheep, since it occurs largely in the suint of wool or sweat of that animal; the lustre of wool is also held to be due to the potash consumed in the food.

Recent scientific research has shown the value of iodine as a prophylactic in goitrous conditions when added to a lick as potassium iodide in the proportion of 5 oz. to 100 lb. of the lick; it has also been suggested as of value in promoting fecundity.

In compounding a lick the important constituents will be calcium phosphate, either as sterilized bonemeal or ground rock phosphate. The quantity of salt for the base should be just sufficient to attract the animals.

At first it may be advisable to use 75 per cent. of salt until the animals become accustomed to the taste of the other material, after which the quantity could be reduced to 60 per cent., 50 per cent., or 40 per cent., and the amount of phosphate correspondingly increased.

A satisfactory lick might be composed of:—

	Per cent.
Sterilized bonemeal or ground rock phosphate	25–60
Common salt	73–38
Sulphate of iron	1
Chloride of potash	1

In mixing the ingredients to form a lick, it is important that they should be in a fine state of division and thoroughly incorporated to form a homogenous whole; continuous turning over with shovels on a smooth floor and passing through screens several times offers a satisfactory means to this end.

Proprietary Licks.—Several licks put up ready for use are on sale at various prices, some of which, judged by analyses made by the Agricultural Chemist, are unduly high. The following prices were quoted in Brisbane during February, 1927, either f.o.r. or f.o.b.:—

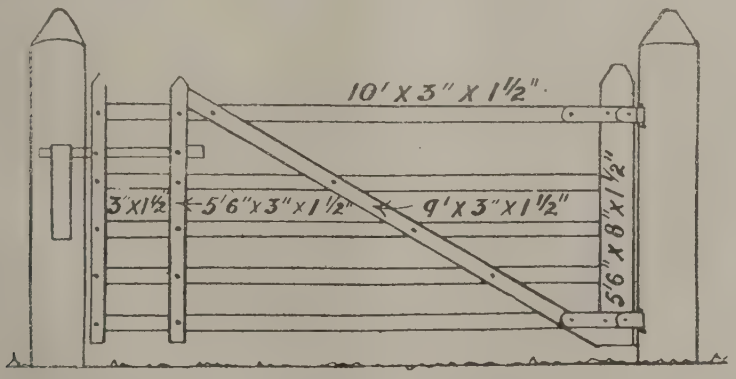
	£	s.	d.	
Ground Nauru phosphate rock, 38 per cent. phosphoric acid	7	10	0	per ton
Sterilized bonemeal, 22 per cent. phosphoric acid	10	0	0	per ton
Refined salt	10	0	0	per ton
Sulphate of iron	0	15	0	per cwt.
Chloride of potash	0	14	6	per cwt.

It will be observed that ground Nauru phosphate rock, while containing 16 per cent. more phosphoric acid, is also £2 10s. per ton cheaper than sterilized bonemeal. Crude salt will be just as effective as refined salt, and probably much cheaper.

Consideration of these prices should convince stockowners that home-mixed licks, while proving as effective as any, will be the most economical.

FARM GATE.

Mr. D. Wass, manager for Messrs. H. E. Kater and Son, of Egelabra, Warren, New South Wales, furnished a year or two ago plan and particulars of a farm gate, which is herewith produced. The specifications are: Two uprights of 8 inches x 1½ inch colonial pine, 5 feet 6 inches long; four uprights of 3 inches x 1½ inch oregon, 5 feet 6 inches long; five bars of 3 inches x 1½ inch oregon, 10 feet long (or length of



gate required); two stays of 3 inches x 1½ inch oregon, 9 feet long (or longer, according to length of gate); one matlock handle for latch; nineteen bolts, each 4½ inches x ⅜ inch; six bolts, each 5 inches by ⅜ inch; two hinges, each 18 inches eye and hook, to suit gateposts. The main gates on Egelabra are 12 feet long, but the plan can be used for any length of gate required. The substantial posts are well braced with sleepers.—"Australasian."

BUILDING TIMBERS.

By C. J. J. WATSON, Queensland Forest Service.

When the right man fills the right job the highest efficiency may be expected. The principle, every man to his own job, is well recognised in business with regard to individuals, but is often disregarded in the building trade with regard to timbers. Careful consideration is given to a man's qualifications before he is placed in a position; in the same way a timber should be fully qualified for the position which it is to occupy.

Individual timber species have "character" as much as men, and the advantages and disadvantages of this should be considered before use. Two sides of the problem must be studied—firstly, the requirements of the job, and secondly, the suitability of the timber for the job. Builders know what qualities are required, but much uncertainty exists as to the right timber to use. This opinion has been formed by observation of the timbers placed in different parts of buildings now under construction in Brisbane.

By summarising the qualities of local timbers it will assist in their selection for different uses. Desirable qualities in timber for various building purposes are discussed herein, and a complete specification of building timbers is also added.

DURABILITY OF TIMBERS.

In Ground.

Durability in the ground is an essential quality in all timbers which are required to be placed wholly or partially under the soil, as in the case of house stumps, piles, sills, telegraph poles, and fence posts. The durability of a timber cannot be judged from its outward appearance or internal structure, but from experience only. Many hard, heavy woods are not at all durable in the ground, while some softwoods, which do not appear durable, give good service. Two such examples are Cypress Pine (*Callitris* sp.) and Grey Teak (Beech) (*Gmelina Leichhardtii*). Probably the most durable of all timbers in the ground is Grey Ironbark (*Eucalyptus paniculata*). Any timber which will not last at least fifteen years in the ground should not be used.

In Weather.

Timbers in exposed positions, such as weather boards, veranda posts, railings, and steps, must be of a durable nature. Timbers which are durable here may fail from some cause when placed underground. Again experience is the best teacher, and it has shown that Red Cedar (*Cedrela australis*), a softwood, is very durable in the weather. Timbers which are durable in the ground are almost always durable above ground. A life of thirty years should be required from timbers of this group. Pines should not be exposed to the weather when much more durable hardwoods are available.

Indoors.

When timbers are used indoors the same high degree of durability is not required, provided that the wood is always dry and well aired. Pine which will last only a few months unprotected in the weather will last a lifetime inside. English Oak has been known to last over 500 years under cover, and there is no reason why our more durable hardwoods should not last over a thousand years under similar conditions. The presence of stagnant, damp air provides the best condition for the development of rot in timber.

Under Water.

Timber is often used under water, as in wells and boat-planking. Under such conditions the wood decays most rapidly at the water-line. Pure water does not rot timber, but preserves it by preventing the attacks of destructive fungi. Where the water rises and falls on the timber, and especially if dirty, rot quickly sets in, and under such conditions either a very durable timber must be used or the timber must be properly protected from the water by paint, varnish, or similar covering.

Hoop Pine boat-planking will last for many years if kept properly painted, even though the boards become saturated with water, but if rain water is allowed to enter the inside, and the boat hatches are kept closed, the stale, damp air inside will rapidly cause the timber to rot.

Borer Resistant.

Certain timbers are insect resistant on account, of certain chemicals contained in the wood. This is a very valuable quality in places where white ants or borers

are common. Cypress Pine (*Callitris* sp.) is never attacked by white ants unless the timber is partly sapwood or rotten heartwood. Other hardwoods are not relished by white ants. This increases their value for fencing posts, telegraph poles, and similar underground work. Some timbers are particularly liable to borer attack, and should be handled with great care. Sapwood is always more attractive to borers than heartwood, and wherever possible should be cut off.

The sapwood of Black Bean (*Cantanospermum australe*) is particularly relished by borers, and that of Spotted Irongum (*Eucalyptus maculata*) is also a favourite. The Tulip Oaks (*Tarrietia* sp.) and Blush Cudgerie (Maiden's Blush) (*Euroschinus falcatus*) are timbers which become quickly riddled with small borer holes if care is not taken in stacking. The She Oaks (*Casuarina* sp.) provide the favourite home of the large white borers.

To prevent borer attack stacks should be kept well aired and in a dry condition while seasoning, and all sapwood should be removed.

Teredo Resistant.

All timbers which are used below water-line in tropical tidal rivers are attacked to some extent by the teredo (*Teredo navalis*). The point most attacked is at low-tide level. Turpentine (*Syncarpia laurifolia*) and Swamp Box (Mahogany) (*Tristania suaveolens*) are teredo resistant if used with the bark intact. Should the bark become rubbed off they are subject to attack. Cypress Pine (*Callitris* sp.) and Brown Pine (*Podocarpus elata*) are also teredo resistant to some extent even when sawn. All other timbers should be sheathed.

Fire Resistant.

Timbers which are fire resistant are valuable for important structural work, such as country bridges, telegraph poles, and fencing. Turpentine (*Syncarpia laurifolia*) practically holds pride of place amongst all Australian woods for resistance to fire. In this respect Turpentine has a decided advantage over Ironbark, which is very inflammable. Telegraph poles of Ironbark are often burnt through by grass fires which do not damage Turpentine poles. Red Satinay (*Syncarpia Hillii*), which is a firm cabinet wood, is also extremely fire resistant, and is suitable for the manufacture of fireproof doors.

STRENGTH OF TIMBERS.

Strength is a very desirable quality amongst structural timbers. Strong timbers can be used in smaller sizes than weak ones, and thus save space and also timber. When a weak timber is used in a structure, much cross bracing and strutting is required to give it sufficient strength. By using strong timbers a much simpler design can be constructed.

Strength can be defined as the resistance to fracture under a load, but the load can be applied in several different ways.

Tensile.

Most of our hardwoods have ample tensile strength, and where failure occurs it is usually found to be due to bending or shearing. All our local hardwoods will withstand a heavy tensile stress, but Grey Ironbark (*Eucalyptus paniculata*) is at the head of the list. A common example of a structural member under tension is a wall brace.

Crushing.

Crushing stress may be applied on the end grain (cross-section of the wood fibres) or long grain (longitudinal section of the fibres). Local hardwoods offer a very high resistance to crushing. An example of crushing on end grain is the top of a column or post carrying a load. Long columns fail by bending rather than by the crushing of the fibres. Crushing on long or side grain is seen when a joist rests upon a support with a load above.

Bending.

Most failures in structures occur either as the result of members bending and fracturing, or shearing along the fibres. Thus a timber which can carry a heavy load under a bending stress is a very useful one. Beams or girders carrying loads are subjected to a bending stress. Cantilever beams require to be specially strong, because in these the principle of leverage is brought into operation. Although

many are very strong, brittle timbers are not favoured for use under bending stresses, because they give little warning by bending before complete fracture. Such a timber is Red Irongum (Blue Gum) (*Eucalyptus tereticornis*).

Grey Ironbark (*Eucalyptus paniculata*), with an average modulus of rupture of about 20,000 lb. per square inch, is the strongest of local hardwoods in bending, and is the most suitable timber to use in any place where a heavy load has to be carried. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*) is also a very strong timber, but is not equal to Grey Ironbark.

Where the spans are short, as in ordinary dwellings, most of the common hardwoods are suitable. Rose Gum (Flooded Gum) (*Eucalyptus saligna*) has only a little over half the strength of Grey Ironbark.

Hoop Pine and Bunya Pine (*Araucaria* sp.) are very strong timbers of the Pine family, and are much stronger than Kauri Pine (*Agathis* sp.) or Cypress Pine (*Callitris* sp.). Oregon Pine is only five-sixths as strong as Hoop Pine.

Shearing.

Shearing may take place either across or along the fibres. Failure from the shear across the fibres seldom happens in practice, as the fibres exert an enormous resistance to fracture in this direction. Failure from shear along the fibres or splitting off is much more common. Tough timbers are best fitted to resist this. Boards of fissile timbers shear or split along the fibres to the end when nailed near the end, but tough woods do not do this. Tough hardwoods which resist shearing along the grain are Grey Ironbark (*Eucalyptus paniculata*) and Red Irongum (Blue Gum) (*Eucalyptus tereticornis*). Grey Blackbutt (*Eucalyptus pilularis*) and Red Messmate (Red Stringybark) (*Eucalyptus resinifera*) are generally fissile. Timbers with interlocked fibres best resist longitudinal shearing, and almost all local hardwoods are much harder to split across the growth rings or radially than parallel to the growth rings or tangentially.

Torsion.

Torsional or twisting stresses are very common in practice, especially when buildings are subjected to wind pressure. This combines tensile, crushing, and shearing stresses. Tough, strong, straight-grained timbers are best suited to resist torsional stresses. Grey Ironbark (*Eucalyptus paniculata*) is the strongest local timber for this purpose. All the other local hardwoods are quite strong enough for ordinary building purposes. Hoop Pine (*Araucaria Cunninghamii*) is much tougher and will stand a much greater twisting stress than Oregon (*Pseudotsuga Douglasii*).

OTHER TIMBER CHARACTERISTICS.

Hardness.

Hard timbers are more difficult to work, but they resist wear much better than softwoods. Timbers for such work as wharf-decking, paving blocks, unprotected stair-treads, and flooring should be as hard and tough as possible to resist wear. They must also be very durable, and not liable to rot. Only the best of hardwoods should be used in such places.

Toughness.

Tough timbers are also difficult to work, but are indispensable for positions where resistance to splitting is required, such as in the naves and felloes of wheels, and stem-posts of boats. Toughness in timber also prevents splitting of boards during nailing operations, and holds nails more securely. The arrangement and cohesion of the wood fibres are responsible for the degree of toughness in the wood.

Softness.

Joinery and cabinet woods must be fairly soft to permit of easy and economical working. Only in rare cases, as in Red Cedar (*Cedrela australis*) and Grey Teak (Beech) (*Gmelina Leichhardtii*), are very soft woods durable in the weather. Softwoods are often tough but seldom very strong in bending, and should not be relied upon for strength. Softness is not a good quality in flooring, because it becomes disfigured and quickly worn.

Close Grain.

Close-grained woods are less liable to splinter under wear than those which are open-grained, and are also more impervious to water. Close-grained timbers are cheaper to paint or polish, because they present a smoother surface and require less material to fill the grain.

Colour and Figure.

Timbers with a pleasing colour or figure are more valuable for cabinet work, but make little difference in structural timbers, except in fancy flooring. Colour and figure do not indicate durability, while ripple-figured woods are seldom very strong in bending. Some timbers, such as Red Messmate (Red Stringybark) (*Eucalyptus resinifera*), with a pleasing colour, have become more highly regarded than they deserve, when the important factor of durability is fully considered.

Effect on Nails.

Some timbers, generally those of a greasy nature, do not rust iron. This is a feature which is very useful in structures in which a large number of nails or screws are used, or where iron fastenings are used. The iron is never weakened by corrosion. Two woods of this type are Crow's Ash (*Flindersia australis*) and Yellowwood Ash (*Flindersia Oxleyana*).

Greasy Woods.

Greasy woods are usually very durable in the weather. These also wear smoothly, and finish with a very slippery surface suitable for dance floors. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*), Tallowwood (*Eucalyptus microcorys*), Crow's Ash (*Flindersia australis*), Yellowwood Ash (*Flindersia Oxleyana*), and Leopard Ash (*Flindersia collina*) are timbers of this type.

SEASONED TIMBER.

A building which is constructed throughout of fully-seasoned timber is much more valuable to its owner than one made of unseasoned timber, because it is more durable and will give a longer life with little expense in repairs; it is stronger and has a better appearance through the absence of faulty points and cracks, and will not damage floor coverings through the raised edges of boards. The little extra cost of obtaining and working the harder timber is more often offset by the many advantages.

The advantages of seasoned timber may be summarised thusly:—

Extra Durability.

The wood does not crack or shrink and open the joints to let in the weather and hasten decay. It is particularly important that the rain should not find its way through the external sheeting, through bad joints, and attack the soft pine lining.

The timber is much less subject to decay if placed in the house in a dry state. Dampness is the greatest aid to decay, especially in badly aired places.

Dry timber holds paint and varnish better, and the timber is well protected from the weather.

Frequent expensive repairs due to decaying parts are unnecessary.

Strength.

The building is stronger, and thus less liable to damage by storms, owing to well-fitting joints and sound timber. Joints which fit when the timber is unseasoned will show wide gaps within a few months. Seasoned timber does not change its shape or shrink.

Appearance.

When fully-seasoned timber is used, no open joints are visible in the railings, veranda flooring, or outside walls of the building; all the outside V-jointed lining boards are close together and do not show the tongues, all mitred joints are close, and no cracked, twisted, or warped boards are seen. Everything looks well made. This greatly increases the value of the house from the point of beauty.

Damage to Flooring Coverings.

Seasoned flooring boards do not curl up at the edges, and greatly increase the wear on the linoleums and carpets at these places.

In using seasoned timber in a building the carpenter has the advantage of handling lighter timber, of which he can carry more super. feet to the ton, and so cheapen his cartage. Half seasoned pine and unseasoned hardwood will weigh about 1 lb. more for every super. foot handled. When the building is completed the

carpenter has the satisfaction of knowing that he has made a good job, which does him credit, and has no fears that the timber will shrink within a few months and ruin his good work.

PART I.—HARDWOODS.

(a) For Use in the Ground.

(House blocks, fence posts, sills, piles, &c.)

1. Grey Ironbark (*Eucalyptus paniculata*).
2. Narrow Leafed Ironbark (*Eucalyptus crebra*).
3. Red Leafed Ironbark (*Eucalyptus sideroxylon*).
4. Broad Leafed Ironbark (*Eucalyptus siderophloia*).
5. Red Bloodwood (*Eucalyptus corymbosa*).
6. Yellow Stringybark (*Eucalyptus acmenioides*).
7. Yellow (Gympie) Messmate (*Eucalyptus clæziana*).
8. Red Irongum (Blue Gum) (*Eucalyptus tereticornis*).
9. Grey Irongum (Grey Gum) (*Eucalyptus punctata*).
10. Grey Irongum (Grey Gum) (*Eucalyptus propinqua*).
11. Tallowwood (*Eucalyptus microcorys*).
12. Yellow Ironbox (Yellow Box) (*Eucalyptus melliodora*).
13. Grey Ironbox (Gumtop Box) (*Eucalyptus hemiphloia*).
14. Black Ironbox (Thozet's Box) (*Eucalyptus Raveretiana*).
15. Crow's Ash (Teak) (*Flindersia australis*).
16. Hickory Ash (Cairns Hickory) (*Flindersia Ifflaiana*).
17. Turpentine (*Syncarpia laurifolia*).
18. Swamp Box (*Tristania suaveolens*).
19. Western Cypress (*Callitris glauca*).
20. Coast Cypress (*Callitris arenosa*).

Note—

No. 5 should not be sawn on account of prevalent gum veins.
No. 18 is brittle and weak and should only be used in large sizes.
Nos. 19 and 20 are semi-hardwoods and will not carry a very great load.
Nos. 3, 12, 13, and 19 are mostly inland species.
No. 14 occurs at Mackay and No. 16 in North Queensland.
All timber should be matured and free from sapwood.
Ironbark should be preferred where great strength is required.

(b) For Use Above Ground in the Weather.

(Veranda posts, railings, exposed flooring, steps, weather boards, &c.)

Timbers as for (*a*), with the exception of Red Bloodwood (*Eucalyptus corymbosa*), Swamp Box (*Tristania suaveolens*), and Turpentine (*Syncarpia laurifolia*). Western and Coast Cypress (*Callitris glauca* and *arenosa*) may be used for external sheeting only when other hardwoods are difficult to obtain. These are not strong. The following may also be included:—

21. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*).
22. Lemon Irongum (Lemon Scented Gum) (*Eucalyptus citriodora*).
23. Grey Blackbutt (*Eucalyptus pilularis*).
24. Red Messmate (Red Stringybark) (*Eucalyptus resinifera*).
25. White Blackbutt (White Stringybark) (*Eucalyptus engenioides*).

Note.—All timbers should be fully seasoned before use.

(c) For Use when Protected from the Weather.

(Plates, bearers, joists, studs, braces, &c.)

Any timbers as for (B), with the addition of:—

26. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
27. Turpentine (*Syncarpia laurifolia*).
28. Brush Box (*Tristania conferta*).
29. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
30. Yellow Satinash (*Eugenia gustavioides*).
31. Grey Satinash (White Eungella Gum) (*Eugenia* sp.).
32. Pink Satinash (Water Gum) (*Eugenia Francisii*).
33. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
34. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).

Note.—All timbers should be fully seasoned before use. Nos. 26 to 33 shrink much more than usual in seasoning, and must be dry before use. Bearers, &c., carrying very heavy loads should be of ironbark.

(d) Fancy Hardwoods and Semi-Hardwoods for Indoor Polished Floors.

24. Red Messmate (Red Stringybark) (*Eucalyptus resinifera*).
26. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
21. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*).
11. Tallowwood (*Eucalyptus microcorys*).
15. Crow's Ash (Teak) (*Flindersia australis*).
35. Yellowwood Ash (Yellowwood) (*Flindersia Oxleyana*).
36. Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
37. Rose Mahogany (Rosewood) (*Dysoxylon Fraseranum*).
34. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).
38. Miva Mahogany (Red Bean) (*Dysoxylon Muelleri*).
29. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
33. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
39. Rose Marara (*Weinmannia lachnocarpa*).
40. Red Tulip Oak (Red Crow's Foot Elm) (*Tarrietia peralata*).
41. Black Bean (Beantree) (*Castanospermum australe*).

Note.—Nos. 21, 11, 15, and 35 are of a greasy nature, and are specially suitable for dance floors. It is most important that all of these timbers be seasoned for at least one year before nailing down. Quarter-sawn boards shrink less and keep their shape better than others.

PART II.—SOFTWOODS AND SEMI-HARDWOODS.

(a) Rafters, &c., Under Roof.

(B class containing sound knots and stain not seriously decreasing the strength of the timber.)

1. Hoop Pine (*Araucaria Cunninghamii*).
2. Bunya Pine (*Araucaria Bidwelli*).
3. Western Cypress (*Callitris glauca*).
4. Coast Cypress (*Callitris arenosa*).
5. Kauri Pine (*Agathis Palmerstoni*).
6. Kauri Pine (*Agathis microstachya*).
7. Kauri Pine (*Agathis robusta*).
8. Brown Pine (*Podocarpus elata*).
9. Black Pine (*Podocarpus amara*).
10. Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
11. Rose Walnut (*Endiandra discolor*).
12. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
13. Blush Walnut (Hard Bolly Gum) (*Beilschmiedia obtusifolia*).
14. Grey Walnut (Hard Bolly Gum) (*Beilschmiedia elliptica*).
15. Oak Walnut (Corduroy) (*Cryptocarya corrugata*).
16. White Walnut (Purple Laurel) (*Cryptocarya obovata*).
17. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
18. Grey Sassafras (*Doryphora sassafras*).
19. Grey Sassafras (*Daphnandra aromatica*).
20. Grey Sassafras (*Daphnandra repandula*).
21. Yellow Satinash (Water Gum) (*Eugenia gustavioides*).
22. Grey Satinash (White Eungella Gum) (*Eugenia* sp.).
23. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
24. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).
25. Red Carrobean (*Weinmannia Benthami*).
26. Yellow Carrobean (*Sloanea Woolsii*).
27. White Ash (*Flindersia pubescens*).
28. Silver Ash (Bumpy Ash) (*Flindersia Schottiana*).

Note.—Nos. 5, 6, 9, 15, 19, 20, 21, 22, 23, 24, and 27 occur in North Queensland.

(b) Internal Sheeting.

First-class timber from species under Softwoods and Semi-Hardwoods (A), to which may be added the following timbers, which are mostly lighter, softer, and weaker.

27. Yellow Cheesewood (Leichhardt Tree) (*Sarcocephalus cordatus*).
28. Cherry Alder (Water Myrtle) (*Eugenia parvifolia*).
29. Blush Butternut (Sarsaparilla) (*Alphitonia franguloides*).
30. Rose Butternut (N.Q. Bolly Gum) (*Blepharocarya involucrigera*).
31. Silver Quandong (Blue Fig) (*Elæocarpus grandis*).
32. Brown Quandong (*Elæocarpus coorangooloo*).
33. Grey Quandong (*Elæocarpus ruminatus*).
34. Grey Teak (Beech) (*Gmelina Leichhardtii*).
35. Grey Teak (Beech) (*Gmelina fasciculiflora*).
36. White Silkwood (Putts Pine) (*Flindersia acuminata*).
37. Brown Bollywood (Bolly Gum) (*Litsea reticulata*).
38. Brown Bollywood (Bolly Gum) (*Litsea ferruginea*).
39. Brown Cudgerie (Mango Bark) (*Bursera australasica*).
40. Blush Cudgeria (Maiden's Blush) (*Euroschinus falcatus*).
41. Pencil Alder (Pencil Cedar) (*Ackama Muelleri*).
42. Rose Alder (Feather Top) (*Ackama quadrivalvis*).
43. Yellow Siris (Yellow Bean) (*Albizzia* sp.).
44. Oregon Pine (Douglas Fir) (*Pseudotsuga Douglasii*) (U.S.A.).

Note.—All timbers must be seasoned before use. No sapwood should be allowed in boards on account of the risk of borer attack.

Nos. 27, 29, 30, 32, 33, 35, 36, 38, 42, and 43 occur in North Queensland.

(c) Indoor Flooring (Covered).

Timbers as for (B) class containing sound knots, stain, and minor defects not affecting the strength of the timber.

Oregon Pine edge grain only.

(d) Special Softwoods for Joinery, Mouldings, Skirtings, Turnery, &c. (Under Cover).

In addition to the Pines Nos. 1 to 2 and 5 to 9 under (*a*).

Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
White Ash (*Flindersia pubescens*).
Silver Quandong (*Elæocarpus grandis*).
Grey Teak (Beech) (*Gmelina Leichhardtii*).
Grey Teak (N.Q. Beech) (*Gmelina fasciculiflora*).
White Silkwood (Putts Pine) (*Flindersia acuminata*).
Laurel Silkwood (Mazlin's Beech) (*Cryptocarya oblata*).
Brown Bollywood (Bolly Gum) (*Litsea reticulata*).
Brown Bollywood (Bolly Gum) (*Litsea ferruginea*).
Pencil Alder (Pencil Cedar) (*Ackama Muelleri*).
Rose Alder (Feather Top) (*Ackama quadrivalvis*).
Yellow Siris (Yellow Bean) (*Albizzia* sp.).
Maple Silkwood (Maple) (*Flindersia Brayleyana*).
Rose Silkwood (Silkwood) (*Flindersia Pimentelliana*).
Silky Oak (Bull Oak) (*Cardwellia sublimis*).
Silky Oak (*Grevillea robusta*).
Satin Oak (*Embothrium Wickhami*).
Red Cedar (*Cedrela australis*).

(e) Special Durable Softwoods, Suitable for Sashes, Fascia Boards, Mouldings, Sweeps, &c., Exposed to Weather.

Red Cedar (*Cedrela australis*).
Grey Teak (Beech) (*Gmelina Leichhardtii*).
Grey Teak (Beech) (*Gmelina fasciculiflora*).
Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
White Silkwood (Putts Pine) (*Flindersia acuminata*).
Yellow Siris (Yellow Bean) (*Albizzia* sp.).
Silky Oak (Bull Oak) (*Cardwellia sublimis*).
Silky Oak (*Grevillea robusta*).
Satin Oak (Pine Oak) (*Embothrium Wickhamii*).
White Ash (*Flindersia pubescens*).
Silver Ash (Bumpy Ash) (*Flindersia Schottiana*).

CHICORY.*

Chicory (*Cichorium intybus*) is a perennial plant grown mainly for its roots which, after roasting and grinding, are used as an adulterant in coffee. In some regions it is also grown as a fodder crop. There are several varieties in cultivation, the commonest being Brunswick and Magdeburg. Being a perennial and with a long tap root, chicory is liable to become an objectionable weed if escaped from cultivation.

Climate.

The climatic requirements of chicory are somewhat similar to those of sugar beet, temperate regions with a good summer rainfall being most suitable for its cultivation. At present the chief centres in Victoria for the production of chicory are French Island, Phillip Island, and Hastings.

Soils.

Prefers a deep, free, easily-worked sandy loam with an open and well-drained subsoil. Will also grow well on poorer soils; but, owing to the very high costs per acre involved in raising this crop, it would be inadvisable to attempt its cultivation on any but the most suitable soil. As a good tap root is desired the plant must be able to root deep so that waterlogged areas and soils with an impervious hard pan near the surface are unsuitable unless such faults are corrected.

Preparation of the Seed Bed.

The land should be ploughed as deeply as possible in August or early September, and then harrowed down to a very fine tilth, resembling an onion bed. As the seeds take some four or five weeks to sprout, it is necessary that the land should be very clean, otherwise weeds are liable to overtop or smother the young plants.

Seeding.

The most suitable time for sowing in Victoria is usually during late September or October. The seed should be sown in drills 16 to 18 inches apart, and as shallow as possible, not deeper than ½ to ¾ of an inch. About 1 to 1½ lb. of seed per acre will be required.

When the plants are an inch or so in height they should be carefully thinned out in the drills, one plant being left to about every 5 or 6 inches. As soon as weeds appear, hoeing must be commenced. During summer weeds are kept down and the surface of the soil kept loose by means of the wheel or hand-hoe. The hoeing should be quite shallow, only deep enough to lift the weeds and loosen the surface. No cultivation is given after March.

Manures.

Like other root crops, chicory responds well to potassic and phosphatic fertilisers so that heavy dressings of potash and superphosphate will give greatly increased yields. Nitrogenous manures tend to develop the leaves at the expense of the roots and should therefore be avoided.

Harvesting.

The crop ripens about July, but digging usually starts in May on account of the time taken to harvest the crop, one man being able to lift an acre of roots in about ten days. The method of lifting usually employed is to run a light furrow along each row, thus exposing the roots, which may then be dug out with strong forks and laid in rows. The next process is "topping," the green tops being cut off with a sharp knife, and the roots thrown into heaps. The "tops" are much relished by stock, and are preferred to any other kind of forage. The roots are then thoroughly washed either in wooden vats or revolving root-washing machines. To dry the roots it is necessary to cut them into the thinnest possible slices, after which they are slowly dried in special "chicory kilns."

The average return of dried chicory on Phillip Island is, approximately, 1 ton per acre, though some growers have secured as much as 3 tons of dried chicory. To obtain such a yield, 11 tons of green roots are required.

As the local market for dried chicory is a limited one, intending growers would be well advised to make some arrangements with the merchants to take their crop at a fixed minimum price before committing themselves on a large scale.

Price of seed in Melbourne, 4s. 6d. per lb. Quantity per acre in drills, 4 to 5 lb. Price in Brisbane for last two years, £40 to £45 per ton. Duty on imported chicory, £28 per ton.

* Reprinted from the "Journal of the Department of Agriculture of Victoria," October, 1921.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this section, unless otherwise stated, has been taken from the "International Review of Agriculture," published at Rome by the International Institute of Agriculture.

How to Give Women a Taste for Country Life.

Congrès international d'orientation professionnelle féminine. Bordeaux (France), 23-26 September, 1926. Bordeaux, 1926.

The International Congress on Vocational Direction for Women met at Bordeaux from 23rd to 26th September last, and was attended by representatives of numerous organisations and eminent persons interested in the problem. The origin of this Congress was the recognition of the fact that workers should be enabled to enter the occupations best suited to their capacities, thereby ensuring a greater advantage to the community owing to improvement in output, as well as to the individual who is thus occupied in accordance with his or her own bent and aspirations. A practical policy has been outlined and important inquiries undertaken on the subject in Germany, France, Belgium, the United States, England, Great Britain, Czechoslovakia, &c.

The desirability of working along these lines in connection also with the agricultural occupations has been recognised, as appears from a special resolution passed at the recent Congress. This resolution takes into consideration the serious menace to agricultural prosperity involved in any distaste for country life on the part of women or girls, and on the other hand the fact that for the child in the country districts there is a natural bias towards rural occupations, which has only to be fostered and encouraged in the school, and urges:—

(1) That the spirit and the methods of the rural school shall be so conceived as to give the girls a direction and bias towards household and rural occupations;

(2) That instruction in household management, frankly rural, should be given to all girls in country districts between the ages of sixteen and eighteen, and that such instruction should be assigned so as to impart ideas and practical knowledge of a kind likely to make them good farm housewives and to counteract any tendency towards migration to the cities; all types of farm household management schools are to be recommended; wherever possible, however, preference is to be given to the school at a fixed centre, supplying continuous instruction and with a farm attached;

(3) That farmwomen's clubs or circles should be established and developed, which, together with lectures, competitions in professional skill, and other methods of diffusing interest and rousing the spirit of wholesome rivalry, will contribute to the further training and vocational development of the rural housewife.

The Higher Training Institute of Farm Household Management at Laeken.

DE VUYST, Paul: L'insegnamento dell'economia domestica nel Belgio. From the "Bullettino dell'Agricoltura," Milan, No. 15, 1926.—Sixième rapport annuel sur l'Institut Normal Supérieur d'Economie Ménagère Agricole. Domaine d'Hossegem. Laeken, 1925-26. Renaix, 1926.

In order to promote the higher teaching of farm household management in Belgium the Institut Normal Supérieur d'Economie Ménagère Agricole has been founded at Laeken.* It is intended for girls of over seventeen who have completed an intermediate school course. The object in view is not merely the training of teachers and responsible mistresses of intermediate grade, but also to equip the daughters of large landowners and cultivators on a large scale for rural life and for Belgian social rural activities. The aim of the Institute is, definitely, to train selected elements for the work of raising, by teaching and example, the general moral and social level of the country districts. In the sixth year of working, the courses were taken by 180 girls. The annual average number of pupils in the last four years was 75. Of the 75 registered in 1925-26, 8 came from families of large landed proprietors, 32 from families of cultivators, and 35 from other families. As regards place of origin, 64 came from villages, 9 from provincial towns, and 2 from the large towns. There were 60 applications for the 25 vacancies for students in September last.

*On the subject of the teaching of farm household management in Belgium, see the article published in the January-March 1923 number of the "International Review of Agricultural Economics."

Of those who qualify as teachers of farm household management, the majority devote themselves to teaching in the State schools and in the non-State supported schools, or do farm work on the home farm.

Constant improvements are being introduced into this branch of teaching by means of the Institute, its scientific methods, the conferences, and experimental work which it organises, and all its new departures in various directions. Its reputation stands high in other countries, as appears from the frequent visits made by foreigners and from the fact that the courses are attended by numerous foreign students. The organisation and working are the subject of study by many specialists.

THE DAIRY INDUSTRY.

DEPARTMENTAL AID.

The Acting Premier and Minister for Agriculture (Hon. W. Forgan Smith) referring to a recent statement of the chairman of the Warwick Co-operative Association Limited, that the Government's promise to assist dairymen whose herds had been depleted by the drought had not been given effect to, has supplied the following information:—

The chairman's statement is quite incorrect and it would appear that he does not fully understand the position. The chairman, according to the Press reports, objects to all applications from dairymen being treated on their respective merits, and states that the Government promised to grant loans for the purchase of dairy stock on the sole security of the stock so purchased. It is obviously true that all cases have been considered on their merits, and this is in accordance with the wishes of the recent deputation to me on the subject by representatives of the Queensland Dairy Companies' Association.

During the discussion at that time it was indicated by me that where a dairy farmer's assets were already mortgaged to a private bank or other mortgagee, the farmer should in the first place seek additional assistance from such mortgagee towards restoring his dairy herd, as the further advance would be for the protection of the mortgagee in helping the farmer to meet his obligations to him for interest and repayment of his original loan.

Perhaps this explains the chairman's reference to a loan having allegedly been refused by the Agricultural Bank because the applicant was not already a client of the bank. It may be added that where further assistance has been refused by the present mortgagee the Agricultural Bank is still dealing with such cases on their merits, and in some instances has taken over the private mortgage debt to enable it to make a further advance available for the purchase of dairy stock.

The following is an extract from a letter sent by me to the Association following the deputation:—

> "As to granting loans to individual dairy farmers, the Agricultural Bank Act, as already explained to the deputation, contains sufficient provision to meet the situation. Through the channels of the Agricultural Bank the Government has already given special consideration to applications of settlers generally for assistance necessitated by the recent drought, and in that connection about £70,000 has been granted during the past year; this sum includes many loans for the purchase of dairy stock. The bank will continue to give special consideration, on their merits, to applications of this nature; provision has already been made for dealing urgently with these cases in priority to all other business, so that assistance may be rendered as quickly as possible."

Many applications have been received during the last few weeks and special endeavours have been made to see that no suitable and deserving case has been refused assistance. Some propositions submitted have been quite unsuitable, but even herein certain cases assistance has been offered provided a suitable guarantee were forthcoming. In some cases with assets already mortgaged it has been found that even the dairy stock applied for from the Agricultural Bank would be included in the security held by the present mortgagee.

In satisfactory cases loans have been approved for dairy stock on the security of the stock to be purchased notwithstanding the chairman's assertion to the contrary.

In conclusion, I desire to repeat that the Agricultural Bank is making special efforts to assist in every suitable case.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MARCH, 1927 AND 1926, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1927.	Mar., 1926.		Mar.	No. of Years' Records.	Mar., 1927.	Mar., 1926.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	9·08	26	6·48	5·62	Nambour	9·32	31	18·24	3·94
Cairns	18·06	45	9·72	6·81	Nanango	3·35	45	7·94	1·54
Cardwell	16·25	53	8·18	7·62	Rockhampton ...	4·71	40	5·66	1·58
Cooktown	15·37	51	7·97	5·03	Woodford ...	8·01	40	16·46	2 12
Herberton	8·17	40	6·27	4·59					
Ingham	15·78	35	8·59	8·76					
Innisfail	26·33	46	20·08	17·43	*Darling Downs.*				
Mossman	18·07	14	10·37	8·71					
Townsville	7·61	56	3 03	1·78	Dalby	2·73	57	4·85	3·44
					Emu Vale ...	2·45	31	3·82	0·35
					Jimbour	2·55	39	6·40	0·94
Central Coast.					Miles	2·67	42	5·85	1·37
					Stanthorpe ...	2·69	54	3·00	0·47
Ayr	6·77	40	3·48	1·60	Toowoomba ...	3·83	55	5·20	0·79
Bowen	5·72	56	3·39	2 84	Warwick	2·58	62	2·05	0·70
Charters Towers ...	3·65	45	4·35	0·36					
Mackay	12·11	56	18·44	8·10					
Proserpine	11·92	24	23·00	9 96					
St. Lawrence ...	5·67	56	2·22	2·29	*Maranoa.*				
					Roma	2·73	53	1·06	0·80
South Coast.									
Biggenden	3·93	28	8·24	1·98					
Bundaberg	5·33	44	10·56	2·84	*State Farms, &c.*				
Brisbane	5·78	76	7·88	1·93					
Childers	4 74	32	6·88	1·74	Bungeworgorai ...	1·68	12	1·54	1·38
Crohamhurst ...	11·74	35	22·78	4·87	Gatton College ...	3·33	27	2·88	2·33
Esk	4·86	40	7·08	2·56	Gindie	2·61	27	6·51	0·46
Gayndah	3 17	56	4·45	1·43	Hermitage ...	2·33	20	2·56	0·46
Gympie	6·21	57	17·01	3·45	Kairi	8 66	12	4·75	7·70
Caboolture	7·65	40	14·21	2·95	Sugar Experiment Station, Mackay	11·08	29	14·53	9·36
Kilkivan	3·90	48	11·29	1·03					
Maryborough ...	6·19	55	7·75	3·41	Warren	2·63	12	3·60	2·03

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March, this year, and for the same period of 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

MAMMITIS.

BY MAJOR A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Under this heading may be included all derangements of the udder which are accompanied by inflammatory changes.

Of all the domesticated animals, the cow suffers most from this complaint, due to the extraordinary development of the mammary glands, as compared with those of the original type. Increased secretory power is accompanied by increased blood supply and glandular tissue, but a decreased resistance to disease.

Mammitis may be divided into two broad classes—(1) simple, (2) specific.

In the first class would be included all those forms in which the primary cause is mechanical, such as injuries, cold, insect stings, overstocking, irregular or improper milking. In these cases the onset of the disease is ushered in with local inflammation, in the area affected. This may be a portion or the whole of a quarter, or even one or more quarters may be involved. Should the affected area be extensive, there will also be constitutional changes, such as rise in temperature and loss of appetite. The local inflammation induces congestion, with the accompanying symptoms of heat, pain, hardness, and cessation of normal milk secretion. The secretion from the congested area is watery, and acid in reaction. This acid fluid, coming in contact with the normal milk in the teat duct, causes it to curdle, and the milk from that quarter will contain clots of curdled milk. Should proper attention be given to the case at this stage, the disease is arrested, and recovery quickly follows. First give a good active purgative, such as 12 to 16 oz. Epsom salts, mixed with a quart of warm water. To this mixture add a cup of treacle and a dessertspoonful of ground ginger, and give as a drench. Local treatment consists of hot foments to the part, and frequent milking. Fomentations to be of value must be long continued—at least two hours once or twice daily.

If treatment has been omitted at this stage, pus-forming organisms invade the inflamed area, gaining an entrance through the milk ducts. The affected area is now an ideal breeding-place, and they multiply very rapidly. Fluids drawn off at this stage will contain pus (matter) in addition to the curdled milk.

In the blood stream are certain cells called Phagocytes whose function is to destroy invading bacteria. These Phagocytes collect in and around the affected area. If they are not sufficiently numerous to destroy the bacteria, they cluster in the surrounding tissue and prevent the spread of the invading organisms. But during this time the toxins produced by the bacteria have caused a breaking down of the cellular tissue, which, when mixed with the toxins, has a debilitating action on the organisms, which lowers their vitality. To further neutralise the action of the bacteria, certain substances known as Opsonius or Antibodies appear in the blood stream and collect around the affected area and eventually destroy the invaders. The organisms having been destroyed, the temperature of the part is reduced, but the presence of the pus produced by their activity still remains and acts as a mild irritant. Should it be small in quantity, it is absorbed into the system, but where the accumulation is considerable, an abscess is formed.

Should the seat of the abscess be deeply surrounded by tissue, the fluid portions are absorbed and a fibrous capsule develops around the remainder. Should the abscess be near the surface, an external opening is formed and the contents evacuated, and the broken-down tissue is replaced by non-secreting tissue. Occasionally the abscess breaks into a milk duct, and the pus can be drawn through the opening in the teat.

During what may be termed the secondary stage of the disease—that succeeding bacterial invasion—hot fomentation is of pronounced value, as it assists in reducing temperature by relaxing the tissues, and also induces a freer blood supply to the part. Should pain be severe, apply a mixture of equal parts of belladonna liniment and soap liniment. Should the weight of the organ cause distress, support it by a broad bandage about 2 feet wide, in which four holes have been made for the teats. Place the teats in the holes, and pass the ends over the loins, tying sufficiently tightly to support the weight of the udder.

In the second class, called Contagious Mammitis, in which the invasion of specific organisms is the primary factor, there are no constitutional symptoms, and very little local inflammation. The first indication of the presence of the disease is the decrease of normal milk in a quarter or quarters, and the presence of a brownish watery fluid. Rarely is there any curdling of the milk, or pus in the milk. As the disease progresses the quarter shrinks and becomes hard and fibrous, and eventually dries up.

In this disease, treatment consists of irrigation of the affected area with mild antiseptic solutions by gravitation. Take a small glass funnel and about 7 feet of

small rubber tubing. Fit one end of the tube to the funnel, and to the other end attach a small milk tube. After careful sterilisation, insert the milk tube into the teat, using care not to injure the lining of the duct. Then, holding the funnel about the level of the cow's back, pour the fluid into it. In the funnel should be a loose pad and sterilised cotton wool to act as a strainer. After the quarter has been distended to its full capacity, remove the milk tube. Massage the quarter carefully, and then draw the fluid off by ordinary milking. Repeat this treatment daily.

Care must be exercised in the selection of the disinfectant for injection, as those which are acid in reaction or have a tendency to coagulate albumen are unsuitable. Normal salt solution made by dissolving one teaspoonful of table salt to the pint of boiled water is of value, or boracic acid 3 per cent. solution.

Quite recently a new method of treating these cases has been placed on the market. The treatment is easily applied, acts quickly, is not expensive, and proves very satisfactory in cases of recent development. The treatment consists of introducing into the system of the patient a vaccine prepared from the various organisms which produce the disease. It is injected with an ordinary hypodermic syringe beneath the skin, usually behind the shoulder. It is supplied in small bottles containing two doses of 2 c.c. each, the second of which is injected about forty-eight hours after the first. In cases of recent origin, two doses are usually sufficient to effect a cure. Treatment is obtainable through this Department, or direct from the Stock Experimental Station, Yeerongpilly.

In dealing with Contagious Mammitis, the infectious nature of the disease must be borne in mind. All affected animals should be removed from the herd, and if possible the person who treats them should not milk the healthy cows. As in small dairies this is not practicable, then these cows should be treated after milking is finished, and care should be taken to thoroughly cleanse the hands immediately after treatment. All fluids drawn from an affected cow should be collected in a vessel and then buried.

LIFE HISTORY OF THE BOT FLY.*

Oestrus Equi. (*Gastrus Equi. Gastrophilus Equi.*) is the largest bot-fly of the horse; length 6 to 7 lines. The body is hairy, yellowish-brown with black, white, or yellow spots; the abdomen has a reddish tinge spotted with black. The wing has near its middle a transverse black band, and black spots at its extremity.

These are common in America, and in Europe, Asia, and Africa. The female has her abdomen prolonged into an ovipositor, by means of which she lays her eggs from June to October, mainly on the legs of solipeds, during the heated hours of the day. Following the horse, she poises opposite the point selected, her ovipositor curved forward beneath the abdomen, darts to the spot, deposits her egg, and instantly flies back. This is repeated again and again, and the long hairs of the fore limbs (forearm, carpus, and metacarpus) are literally covered with eggs.

The *egg* is dull white, conical, and cemented by the button at its apex to a hair. In twenty-four hours it hatches out, and the embryo, crawling under the hairs, creates an itching which leads the horse to lick or bite the part, and the embryo adhering to the damp tongue is taken in and swallowed. The embryos just about to escape from the ovum are taken in by the tongue at the same time.

An *embryo* on reaching the stomach at once attaches itself by its buccal hooks, and especially to the left sac. It is then the size of the egg from which it escaped, and of a blood-red colour, but in the course of the next winter and spring it undergoes three moultings, becoming larger on each occasion, and changing to a yellowish-brown colour.

The *mature larva* (*bot*), as found in the stomach in spring and early summer, measures 7 to 9 lines in length, has a yellowish-brown colour, and is formed of a series of ten rings; all excepting the two last are furnished with a closely-set row of spines directed backward. The ninth ring has a few short spines at the side only. The rings, which in the embryo were soft and fleshy, are now firm and resistant. Many reach maturity from May to October and pass out with the fæces, showing little disposition to hook themselves on to the intestine in their course. They remain in the manure or burrow in the earth, and in twenty-four hours the envelope becomes hard and horny, the stage of *nympha* having been reached.

In thirty to forty days, according to the temperature, the *nympha* opens and the perfect fly escapes.

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* From Law's "Veterinary Medicine."

PIG CLUBS.

THEIR IMPORTANCE AND VALUE IN QUEENSLAND AGRICULTURE.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Much of the information contained in these notes has already appeared in the Journal, and the whole will be incorporated in an illustrated pamphlet, "Pig Clubs for Queensland Scholars," which will be available for issue shortly, free of cost to those interested. Application for copies of this and other extracts from the Journal should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.—ED.

Upon his return from America some years ago, Mr. J. D. Story, I.S.O., Public Service Commissioner, Queensland, brought with him complete plans and details of the American and Canadian Home Project Scheme, which includes Pig and Poultry, Calf, and Garden Clubs, and many others of similar nature adapted to one or other of the varying conditions and environment associated with agriculture there, as well as here in Queensland.

The scheme was duly considered and arrangements were made for the work to be taken over by the late Mr. J. C. Stubbin, then Instructor in Agriculture in the Department of Public Instruction, Brisbane. With the appointment of the writer as Instructor in Pig Raising in the Department of Agriculture and Stock a year or two later, the control of the Pig Club Scheme was transferred to this Department, and was included in the activities attendant upon the organisation and development of the pig industry. The early growth of the scheme was slow, and was fraught with numerous difficulties and hindrances, for not only were many of the teachers and children entirely in the dark as to the objectives and possibilities of the scheme, but in many instances the parents were entirely averse from anything new, experimental, or progressive, and to schemes which many of them seemed to think were "fool stunts" doomed to failure.

The Americans and Canadians experienced similar difficulties in the early days of development there, but, as in the case of our own clubs, they forged ahead, and by dint of solid and continuous work, and with the enthusiastic support of the children have won the day. From very uninteresting proportions here several years ago the scheme has developed until to-day there are more than forty clubs in operation, a dozen or so more in process of formation, with three instructors, Messrs. Shelton and Bostock, of the Department of Agriculture and Stock, and Mr. F. E. Watt, of the Department of Public Instruction, employed in the organisation and development of the administrative side of the project, and numerous head teachers and assistant teachers following the work up and attending to the internal organisation of their own local or district clubs.

The Scope, Objective, and Development of the Pig Club Scheme.

In the United States of America, in Canada, in Great Britain, and in other countries, some thousands of extremely practical and profitable Pig Clubs are in operation, and a deep and wide-spreading interest has been displayed among the younger generation of farmers in the development of this branch of the Home Project Scheme.

It has been shown that in the countries named the boys and girls are being trained and are actively engaging in the most modern phase of pig raising, a training that has proved of the greatest value to these youthful farmers and to the pig industry in the countries in which they reside and operate.

Experience in Queensland has already shown that interest has been stimulated, and that where Pig Clubs have been in operation the conditions under which pigs are kept have been very considerably improved, a result in itself that most assuredly justifies the nominal expenditure involved in taking up these schemes. In the United States, Pig Clubs will be found in operation in almost every county and small centre in Kansas, Iowa, Missouri, and other hog raising centres. These include clubs for

both pork and bacon pigs, for breeding sows, and for sow and litter, and in numerous instances club members have competed successfully in the "Ton Litter" scheme of which the American pig farmer is so proud.

In New South Wales, the Pig Club Scheme is included in the organisation known now as the Junior Farmers' Club Council of New South Wales, a scheme being developed on a very extensive basis and with immense possibilities for future extension. In Victoria and the other States, and in the Dominion of New Zealand, considerable interest has been aroused, and the Home Project Scheme is being widely discussed. Thus it will be seen that it is a movement of world-wide proportions; a movement in which all young Queenslanders should be intensely interested.

PLATE 109 (Fig. 1).—GATHERING OF PARENTS, CHILDREN, AND OFFICIALS AT THE MAPLETON DISTRICT PIG CLUB FETE, NOVEMBER, 1926.

Standing at the table addressing the gathering is Councillor J. T. Lowe, Chairman of the Maroochy Shire Council; on the right and immediately next to the Chairman is Mr. J. D. Story, I.S.O., Public Service Commissioner, Q., who has been largely responsible for the introduction of this modern system of Home Training. At the table also is the Instructor in Pig Raising (Mr. E. J. Shelton), Department of Agriculture and Stock. The Club Members are seated on the ground in front of the official party.

Pig Club Leaders and Organisers.

It will be necessary in the development of the Pig Club project here that Pig Club leaders be appointed to control this work and to co-operate with the State Instructors in Pig Raising, with the organisers, and with the head teachers of Rural and State schools in initiating clubs in the various agricultural and dairying centres throughout the North.

In America, for instance, the work is supervised by the Boys and Girls' Pig Club Department through a State Club leader, who is employed co-operatively by the United States Department of Agriculture and the State Agricultural Colleges; these officials plan details of the work, and put them into operation through assistant State leaders or specialists in club work, who have direct charge of the live stock club work promoted by the colleges. In many centres the detailed work is carried on locally by

the County Farm Bureau (an organisation similar to our local producers' associations) as a definite and very important part of its programme. In centres where Pig Clubs are to be introduced for the first time, the county agent (known as district agents here formerly, and more recently as district secretaries and organisers) secures a local leader who helps to enrol the members and to organise the clubs, while in communities where the Farm Bureau has not yet been organised other agencies are made use of, such, for instance, as county superintendents, Chambers of Commerce and Agricultural instructors. Most of the work, however, is in organised centres having a Farm Bureau or similar association. The local leaders' duty is to encourage boys and girls and to help in an advisory capacity in giving instructions *re* feeding, preparing for shows, and in record keeping. Arrangements are also made for members to meet once a month at least to give attention to club matters, and at these gatherings, which are conducted on social lines, business problems are discussed and suggestions brought forward; thus the meetings are interesting and helpful, and are a pleasure and stimulant to both members and staff. As a progressive step, club tours, picnics, camps, &c., are arranged, and in general the whole scheme is approached as worthy of the utmost consideration and attention. The club motto is especially applicable to our conditions here, viz., "To make the best better."

Plate 110 (Fig. 2).—The Social Side of a Pig Club Fete.

View of the Ice Cream and Soft Drinks Stall, the Fancy Work Tables and Stall, and the Refreshment Booth at the Mapleton District Pig Club Fete.

An endeavour has been made in the organisation of Pig Clubs to interest not only the Girls and Boys but the Teachers, the Parents and Relatives of the Members and of other district children as well as the commercial community. These stalls did good business, they were an added attraction and financially were quite a success; withal they added considerably to the value of the function from a community point of view.

Enthusiasm, loyalty, and service are the three outstanding features in the organisation. Up to the present, however, matters have not progressed to this stage in Queensland, though on numerous occasions lantern lectures on various aspects of pig raising have been a feature of the work, together with round district tours when an official inspection of the various animals competing in the competition formed part of the outing. On these occasions both club members, the head teacher of the State school, and the Instructor in Pig Raising have been present. These homely visits are much appreciated, and are certainly a source of inspiration to the children. They are equally interesting and encouraging to the club leaders, and have been the means of encouraging the different competitors to try and do better than their neighbours in preparing their exhibits for exhibition and sale.

PLATE III (Fig. 3).—ONE OF QUEENSLAND'S MOST ENTHUSIASTIC AND SUCCESSFUL PIG CLUB MEMBERS TOGETHER WITH HIS PARENTS, MR. AND MRS. A. ALFORD, OF TRAVESTON, Q.

Several of the Alford boys are members or ex-members of the Pig Club scheme. The parents and the older members of this family came to Australia as immigrants some years ago from a remote part of England, where their future was anything but bright, and where the prospects for the family were almost nil. They are now successful farmers, keenly interested in better pigs, and their children are enthusiastic workers in the Home Project Scheme and have already won several prizes at Pig Club contests. They are largely interested in the Tamworth breed of pigs and its crosses, and have a registered stud of excellent quality animals that have also been successful prize winners at Brisbane, Nambour, Pomona, and Gympie shows.

PLATE 112 (Fig. 4).—NELLIE AND SAM SELLICK, WITH MR. SELLICK, ENTHUSIASTIC WORKERS IN THE PIG CLUB SCHEME ON THE NORTH COAST OF QUEENSLAND.

These two club members have also been successful in demonstrating that girls and boys can work together for the betterment of the industry and in the interests of the Home Project Scheme.

These photographs are not inserted to boost any particular club member, but to illustrate the type of children interested, together with other members of their household, where this is possible. Mr. Sellick is quite as enthusiastic as his children, and he is a successful farmer, marketing numerous good quality porkers and baconers every year. The family live at Yandina, the children attending the Yandina State School.

PLATE 113 (Fig. 5).—ENTHUSIASTS IN PIG CLUB WORK.
A group photograph taken at a North Coast Pig Club Fete.

PLATE 114 (Fig. 6).—PIG CLUB MEMBERS, BOTH SENIOR AND JUNIOR.
All enthusiastic, intelligent, and capable workers for the benefit of their Club, their district, their State, and their country.

PLATE 115 (Fig 7).—GIRL AND BOY PUPILS AT THE NORTH ARM PIG CLUB'S FETE, NOVEMBER, 1926.
The group includes a number of Pig Club members and enthusiasts, listening to an address at the presentation of prizes.

PLATE 116 (Fig. 8).—MEMBERS OF THE JARVISFIELD PIG CLUB IN THE AYR DISTRICT, NORTH QUEENSLAND.
Their pigs were exhibited at the Ayr Show and created considerable interest and enthusiasm.

Additional Features.

In all club work two principal objectives must be steadily kept in the forefront. First, it is the intention to demonstrate per means of these competitions that there is "Profit in Pigs"; and secondly, that the industry is an interesting and remunerative one well worthy of recognition and of taking up on sound commercial lines. The educational feature is also constantly stressed so that members may the more fully realise that their work in the club means more than the making of money and winning of prizes; for it is important that they should be given opportunities to co-operate in community enterprises and programmes of work which are always best carried out on truly co-operative lines.

Through Pig Clubs the American boys and girls have been taught to look upon the community and its problems not from the mere selfish point of view, but with a spirit that makes for general improvement. The spirit of service and citizenship thus engendered is one that the younger generation can apply all through their lives.

From the industry standpoint it is hoped members here will realise more fully than ever before the necessity of proper care and attention and of improved methods of feeding and housing. Records of the kinds and amounts of food used and the cost or value of same, together with details as to the time spent on the work, are to be kept by club members, and in due course these are to be formulated and presented for the inspection of all concerned in the organisation of the clubs. From a perusal of the essays appended to this article it will be found that quite a number of these features have become impressed upon the young members' minds.

PLATE 117 (Fig. 9).—LEADING THE PIG TO THE SHOW.
A spell by the wayside and light refreshments.

The Extent of the Work.

To show the extent of the work overseas and indirectly the possibilties here, it is interesting to note that recent reports indicate that boys and girls' Pig Clubs owned or managed approximately 1,800 pigs at a profit to themselves of more than 30,000 dollars—this in Kansas (U.S.A.) alone, with 107 clubs and 980 members. Since this report came to hand, other and later reports indicate a much more extensive development, with the formation of many more clubs and club functions. A special feature of the work there is that the members are taught and encouraged (as they are taught and encouraged here) to fit their animals for the show ring, with the result that large numbers of Club Pigs have been shown at local, county, and State fairs, and generous prizes have been won, many times in competition with adult breeders. Club members conduct many valuable demonstrations in this way, and this has stimulated others to better things. Some of the phases demonstrated (and it is along these lines that we in Queensland are working) include the value of balancing the ration, the importance of pasture and forage crops for pigs, costs of pork production, use of self-feeders, care of the brood sow—especially prior to and at farrowing time—care of the litter from birth onwards, proper selection and judging of animals, disease prevention, treatment, and control.

One striking example of this latter phase is in inaugurating new methods in the prevention of worm infestation in young pigs. In this connection it is on record that the United States Department of Agriculture worked out one efficient system by which worm infestation could be prevented, but farmers have been slow to put it into practice or to realise its advantage. For this reason club members in about twelve counties in Kansas were selected to take up demonstration work on these lines. The work was carefully supervised and records kept, and in due course a complete treatise is to be issued showing the nature of the experiments, results, &c. Other demonstrations are conducted in a similar manner. There is a wide field for work in this direction in Queensland, for though in general the health of the pigs in this State compares more than favourably with that of pigs in other States and countries, there is ample scope for reducing the losses and for stamping out the many diseases to which pigs are subject here.

The Pure Bred Scheme.

A feature of Pig Club work is to encourage the use of pure bred breeding stock on farms generally throughout the State. The stock which are to be introduced and used in these clubs will, it is hoped, be retained as the foundation of many new herds; in some instances the stock will be retained on their own farms by club members and their people, in other instances the animals will be disposed of to neighbouring farmers either by auction or private contract. In this way the

Plate 118 (Fig. 10).—Another Exhibit en route to the Pig Club Contest.

The pig was too heavy for its young owner.

whole industry should benefit, though this is necessarily a slow process in an immense State like Queensland. Nevertheless, the State is, after all, only a collection of communities so that as in other parts of the world we are starting at a logical place in the improvement of the herds.

Rules of Membership.

Membership in Pig Clubs is not necessarily confined to any particular class of boys or girls. If required, the membership may be arranged into classes.

(*a*) For school pupils up to the age of fourteen.

(*b*) For pupils whether still attending school or over the age of fourteen.

The rules require that each contestant raises his or her own pig to not more than six months old in the case of bacon pigs, or as arranged in porker classes or classes for stud sow with litter or stud boar. In each case the member must feed and attend to the animal and be entirely responsible for its management and exhibition; this usually requires that the pig be housed and fed apart from any other pigs on the farm unless the member is actually caring for all the pigs kept. Each contestant is required to keep a record on forms to be provided (a notebook may also be kept as an aid to writing the essay) containing any points of interest such as the animal's name and breeding, its purchase price and details of purchase,

date pig was purchased or entered the contest, its actual live weight at time club commenced operations; the nature and quantity of feed used, notes *re* bedding, cleanliness of sty and of animal; the number of days fed, the name, quantity and value of food grown, including crops such as pumpkins, sorghums, maize, lucerne, sweet potatoes, waste fruit, &c.; the animal's weight at end of contest, gain in weight per week or month, market value at current rate per pound when ready for market, profit gained as a result of the transaction; notes *re* the health and well being of the club pig and of other pigs on the farm, class of sty, its size, situation, aspect, approximate size of grazing area, and any other information available.

Where convenient the pigs are to be exhibited at the local or district show, where arrangements will be made for the housing of animals, for judging, &c. If at all possible, contestants are to attend the show and care for their animals there also.

The following scale of points has been drawn up for use in club work, and, if at all possible, will be strictly adhered to in every club initiated.

PLATE 119 (Fig. 11).—ONE OF THE PIG CLUB MEDALS.

Illustrating the type of gold or silver medal included in the prize list at many of the Pig Club contests. Other prizes include pure-bred pigs and other stock, books, trophies, ribbons, and cash.

PIG CLUB AWARD CARD.

Points will be awarded as follows:—

	Possible Points.	Points Awarded.
1. Type and quality of animal selected	15	
2. Rate of increase in weight of animal	10	
3. Cost of production; the use of home-grown foods being an important consideration	15	
4. Sanitation, condition of pig sty and grazing area ..	10	
5. Health of animal, freedom from parasites (lice, &c.)	5	
6. Interest shown in management of the animal by the club member	10	
7. Arrangements for marketing, exhibiting at Show, &c.	5	
8. Essay on "How I selected, fed, managed, and Exhibited my Pig"	10	
9. Market value of animal. Actual live and estimated dressed weight and value per pound to be taken into consideration	10	
10. Order of Merit in Prize List at Show	10	
Possible	100	
Total Points Awarded.		

When Pig Club members have competed in the first instance with a young sow pig, arrangements may be made at the end of the competition for this sow to be entered in a sow and litter club, this competition to be continued into the following year, but this is only possible where sufficient inducement offers and up to the present has not been adopted; this contest it will be found requires much more skill, care, and attention than that required in fattening a pig for market, important and all as is this latter feature of the work.

It will be seen, therefore, that the Pig Club movement has much to commend itself to the children of farmers who are interested in the raising of more and better pigs, for it aims first and foremost at educating the children and at giving them an intensely practical acquaintance with the many and varied aspects of the breeding and management of pigs. That Pig Clubs can be initiated and carried through successfully has now been demonstrated on so many occasions in this State, and the keen, intelligent interest taken in them by the junior farmers has been so pronounced, that it can be definitely stated the movement is here to stay.

Plate 120.—A Pretty but Unprofitable Litter.

Unless breeding sows produce large, thrifty litters of pigs, freely, regularly and consistently they are less profitable than they should be. There is no reason why a well bred, well cared for breeding sow should not produce two litters per annum of at least eight pigs in each litter; the first litter being produced when the sow is about fifteen months old (*i.e.*, allowing for mating at eleven months old or thereabouts), and for the sow to be productive for seven years. Sows, even when they are eight years old, frequently produce satisfactory litters. It is recommended, however, that the sow be culled and fattened for the butcher or bacon factory after having passed the eighth birthday as the teeth usually fail at this age, and the sow is unable to hold her own among other sows in the herd.—E. J. Shelton, Instructor in Pig Raising.

PLATE 121—SETTLERS FROM OVERSEA MAKING GOOD.—THE WALLACE FAMILY, OF KINGSTON.

Mr. T. M. Wallace, Manager, Kingston Pig Farm, arrived with his family from Ireland a couple of years ago. They are now well established in this State and are proud to call themselves Queenslanders.

PLATE 122.—AN ENTHUSIASTIC YOUNG FARMER FROM OVERSEA, GEOFFREY WALLACE, OF KINGSTON.

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing.	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing	July.	Date of Farrowing	Aug.	Date of Farrowing.	Sept.	Date of Farrowing.	Oct.	Date of Farrowing	Nov.	Date of Farrowing	Dec.	Date of Farrowing.
1	22 April	1	23 May	1	20 June	1	21 July	1	20 Aug.	1	20 Sept.	1	20 Oct.	1	20 Nov.	1	21 Dec.	1	20 Jan.	1	20 Feb.	1	22 Mar.
2	23 ,,	2	24 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	23 ,,
3	24 ,,	3	25 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	24 ,,
4	25 ,,	4	26 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	25 ,,
5	26 ,,	5	27 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	26 ,,
6	27 ,,	6	28 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	27 ,,
7	28 ,,	7	29 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	28 ,,
8	29 ,,	8	30 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	29 ,,
9	30 ,,	9	31 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	30 ,,
10	1 May	10	1 June	10	29 ,,	10	30 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	30 ,,	10	29 ,,	10	1 Mar.	10	31 ,,
11	2 ,,	11	2 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	2 ,,	11	1 April
12	3 ,,	12	3 ,,	12	1 July	12	1 Aug.	12	31 ,,	12	1 Oct.	12	31 ,,	12	1 Dec.	12	1 Jan.	12	31 ,,	12	3 ,,	12	2 ,,
13	4 ,,	13	4 ,,	13	2 ,,	13	2 ,,	13	1 Sept.	13	2 ,,	13	1 Nov.	13	2 ,,	13	2 ,,	13	1 Feb.	13	4 ,,	13	3 ,,
14	5 ,,	14	5 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	5 ,,	14	4 ,,
15	6 ,,	15	6 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	6 ,,	15	5 ,,
16	7 ,,	16	7 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	7 ,,	16	6 ,,
17	8 ,,	17	8 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	8 ,,	17	7 ,,
18	9 ,,	18	9 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	9 ,,	18	8 ,,
19	10 ,,	19	10 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	10 ,,	19	9 ,,
20	11 ,,	20	11 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	11 ,,	20	10 ,,
21	12 ,,	21	12 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	12 ,,	21	11 ,,
22	13 ,,	22	13 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	13 ,,	22	12 ,,
23	14 ,,	23	14 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	14 ,,	23	13 ,,
24	15 ,,	24	15 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	15 ,,	24	14 ,,
25	16 ,,	25	16 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	16 ,,	25	15 ,,
26	17 ,,	26	17 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	17 ,,	26	16 ,,
27	18 ,,	27	18 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	18 ,,	27	17 ,,
28	19 ,,	28	19 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	19 ,,	28	18 ,,
29	20 ,,	—	—	29	18 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	18 ,,	29	17 ,,	29	20 ,,	29	19 ,,
30	21 ,,	—	—	30	19 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	19 ,,	30	18 ,,	30	21 ,,	30	20 ,,
31	22 ,,	—	—	31	20 ,,	—	—	31	19 ,,	—	—	31	19 ,,	31	20 ,,	—	—	31	19 ,,	31	22 ,,	31	21 ,,

NOTE.—Black figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April; a sow mated on 1st July is due on 20th October. The chart should be preserved for future reference by breeders of all classes of pigs. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days, this period is sometimes remembered as roughly three months three weeks three days, or 16 weeks. With very young sows the period is sometimes of shorter duration, and instances are on record where young sows have farrowed at from 100 to 108 days after becoming pregnant; on the other hand, old sows in abnormal condition have been known to carry their young for more than 140 days.—E. J. SHELTON, H.D.A., Instructor in Pig Raising.

PIG RAISING PAMPHLETS.

A series of illustrated pamphlets on the subject of Pig Raising are now available for distribution, gratis, on written or personal application to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane, Queensland, as under:—

Feeding and Management of Pigs, &c.

"Feeding Pigs; Stock Foods" (this pamphlet by the Agricultural Chemist deals generally with the subject of stock foods, feeding, &c.). Other Pig Raising pamphlets refer to Flushing the Breeding Sow, Dentition of the Pig, Pigs for Profit, Early History of the Pig, Weaning the Pig, Ton Litter Contests, How to Make a Pig Net, Gestation Chart.

Breeds of Pigs.

The Berkshire, Tamworth, Large Yorkshire, Duroc-Jersey, Poland-China, Gloucester Old Spot, and Middle Yorkshire.

Other breeds are being dealt with now and their special qualifications featured; these pamphlets will be available shortly; they form a useful and attractive series.

Housing and Accommodation of the Pig.

A series of pamphlets on the construction of sties and provision of paddock accommodation for pigs give details in regard to housing and accommodation, useful types of fencing, concrete feeding floors and troughs, convenient crates. This series is being added to from time to time, is well illustrated with photographs and drawings, and should be in the hands of every farmer.

Marketing Pigs in Queensland.

Several pamphlets deal with the subject of Marketing, Care in Handling of Pigs in Transit, Motor Transport of Pigs to Market, &c.

Further articles on this subject are in course of preparation, and will be available in pamphlet form later.

Pig Clubs for Boys and Girls.

The Pig Club pamphlet, descriptive of the organisation and development of pig clubs, is now in course of preparation, and will, it is hoped, shortly be available for distribution. When available, copies may be obtained with any other information relative to the pig club scheme on application to the Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane, or from the Organiser and Instructor in Agriculture, Department of Public Instruction, Brisbane. A pamphlet is also available dealing with the subject of Young Judges' Competitions at Agricultural Shows, Hints to Young Judges, Judging Pigs, &c. This is issued gratis.

Diseases of the Pig.

Pamphlets dealing in a general way with diseases are available, and with Administration of Medicine to Pigs, Diarrhœa or White Scour, Tick Paralysis in Pigs, Sterility or Barrenness in Pigs; A Peculiar Disease of the Ear of the Pig, Hairlessness or Goitre. Leaflets on Profitably Feeding Iodine to Pigs and on other subjects are also available. They carry much useful information.

Castration of Pigs.

This pamphlet is now in the hands of the Government Printer and will be available shortly. Every farmer should secure a copy of this publication. It is also available gratis on application.

The "Queensland Agricultural Journal," issued monthly, carries a regular series of articles on Pig Raising and other branches of agriculture. It costs to farmers but one shilling per annum to cover postage on twelve issues. If not already a subscriber, write for a sample copy and order form.

Answers to Correspondents.

Dip Construction.

R.R. (Sexton)—

The matter of the construction of your dip was referred to the Department of Public Works, and the following is a copy of a memorandum by the Chief Architect thereon:—

The first and cheapest remedy to try and stop the leaks is to get some dry powdered red lead and mix to a putty consistency with water (not oil) and fill in the cracks therewith with a putty knife or similar instrument. Cracks are not to be chiselled out beforehand.

If this remedy fails, a second attempt may be tried by lining the inside of the dip to the height of water level with Val de Travers asphalt put on in two layers to finish ½ inch thick. If this is done I suggest that your correspondent get into communication with Mr. C. L. Sadgrove, A.M.P. Building, Edward street, Brisbane, who is the agent for this material. The cost of this is about 11s. or 12s. per sup. yd. in Brisbane, but, of course, would cost more at Sexton. If your correspondent would forward to Mr. Sadgrove a plan of his dip, giving dimensions, he would probably get a firm quotation for the work to be done.

Mango Chutney.

W.C. (Cleveden, N.Q.)—

Under the Health Act no preservative is allowed in chutney, although in tomato sauce and tomato chutney sauce 2 grains of salicylic acid are allowed per lb. There is no need for preservatives in chutney, and your plan of allowing the chutney to ferment in a barrel prior to bottling is correct. The fermentation, however, should be completed much before three months, two or three weeks should be sufficient, then reboil and bottle hot. Well stoppered the chutney should keep for years. According to the Agricultural Chemist's taste the chutney has a good flavour, but is rather hot.

Angora Goats.

W. F. (Benarby)—

The trouble with the Angora goat in Queensland is that for some quite unaccountable reason, the general public will not eat goat mutton. Personally, I cannot tell the difference, excepting that good goat mutton is more delicate in flavour. I defy anybody to know the difference, when properly cooked, between good goat mutton and good sheep mutton. However, the prejudice exists and it must be considered.

Mohair of the best is worth at most about 2s. 6d. per lb. Low-grade mohair very much less. The best weight is about 5 to 6 lb. per fleece. The goats, too, are very capricious with their young. They are liable to forget them within an hour after they are born. When once they take to the kids they are excellent mothers. I would not advise any man who has even decent sheep country to go in for Angoras.

SHEEP AND WOOL.

Following are selected replies to correspondents by the Instructor in Sheep and Wool, Mr. W. G. Brown, in the course of the month.

Lamb Losses.

M.A.C. (Toogoolawah)—

After a dry season and when excessive wet conditions follow there are always bad conditions for any grazing animals. From your description of the symptoms it seems to me that the animals are suffering from a dietetic trouble, caused by either over-eating or eating some of the deleterious weeds which spring up in a season like this. Apparently the animals have not passed the cud into the fourth stomach. This may mean impaction caused by the eating of the dry feed prior to the rain. Impaction is known by hard masses of food being found in the third stomach or bible. A drench of linseed oil (raw) in milk will help, or a drench of Epsom salts, ½ oz. to 4 oz. of water, often relives it. Are the animals chewing the cud?

Worms in Sheep.

A.R. (Undulla Creek)—

Your letter of the 21st March came duly to hand, and in regard to information *re* worms in sheep, "The Farmers Sheep and Wool in Queensland" Bulletin has been forwarded.

Your young sheep are the ones that are in danger; the two-tooths and the lambs especially so, and, although the 250 aged ewes seem to be doing well, you must not take it from that that they have not the worms, and that was shown when you killed the old ewe and found worms in her. Drenching with the Departmental drench can be repeated once every seventh day until the sheep get back to their usual health, which is shown by the dark-pink skin. It is quite certain that in the wormy season such as we are having now, that one drench is certainly not sufficient. You can not only drench a second time, but you can drench until further orders. Please understand that arsenic is a tonic, and if carefully administered will not injure the sheep in any way. Be very careful in the mixing of the drench and also in the administration that the animals are not knocked about. If you require further information than is given in the Bulletin, please write.

Sheep Suffering with Blight.

A.C. (Canungra)—

The Chief Inspector of Stock, Major A. H. Cory, advises that it is probably ordinary blight from which the sheep are suffering. He recommends 6 grains sulphate zinc 6 oz. water to be syringed into the eyes night and morning. I would be glad to learn the effect of this treatment.

Stomach Worms.

J. McP. (Tipton)—

This correspondent's first question is: "Does the stomach worm or blood worm get the arsenic through the blood of the drenched sheep he feeds on?" The very latest authority states that the action of arsenic on the worms is not understood. It is certainly not taken from the blood, as in some experiments I made some years ago, I drenched the sheep and fifteen minutes later killed the sheep and found many of the worms dead. It is probably absorption through the membranes that they are killed.

Second question: "Does the worm get it direct—that is, does the poison go direct to the fourth stomach and not into the big paunch?" Liquids generally pass over the paunch (rumen) and go directly through the second and third stomachs to the fourth or true stomach. The ruminants or cud-chewing animals have the power of diverting food from the rumen into the other stomachs. If an animal be watched while chewing the cud, it will be noticed that a ball of food is brought into the mouth and when chewed passes down the gullet, but not into the paunch again.

Third question: "Please send the full history of the tapeworm, and does he feed on the blood of an animal?" The full life history of the tapeworm in sheep is not known. One outstanding fact, however, is known, and that is, there must be a secondary host in the case of *Taenia Expansa* (sheep tapeworm); it must have access to a dog. Without a dog there can be no tapeworm. A tapeworm lives principally on the food which passes through the alimentary canal, taking all the nutriment. Sheep thus die, literally of starvation. The worm is not a bloodsucker. Please understand that arsenic in suitable doses is one of the best of tonics. Whether the chemist is right or not, I have used the arsenic and Epsom salts, and have seen it used by others for over thirty years. I certainly would not use soda as a solvent. If the drench be prepared according to directions it will be found that the arsenic is quite dissolved. Medical men assure me that Epsom salts has the property of delaying the action of the poison, and thus it is more likely to kill the worms than if soda be used as a solvent. The late Mr. John Mathison, manager of St. Ruth, used this drench for very many years, so did Archie McLeod, of Bon Accord. I believe the arsenic and Epsom salts to be the best of all, and I have tried many. "The Farmers' Sheep in Queensland" Bulletin, which gives full particulars of the drench, has been forwarded.

BOTANY.

The Government Botanist, Mr. C. T. White, F.L.S., addressed the following replies to correspondents in the course of the month. They are selected from a heavy mail because of their general interest.

Panicum distachyum—"Indigo."

J.S. (Woombye)—

The grass is *Panicum distachyum*, very common in Queensland during the summer months, providing a good amount of leafy forage. It is most abundant along railway embankments, or in fact anywhere where the land has been broken. It is an annual, and makes good hay. We have not heard a common name applied to it.

The plant you take for an Acacia is *Indigofera hirsuta*, a species of "Indigo," a common weed in Queensland. It is sometimes looked upon with suspicion, but we have noticed stock eat it freely without any ill effects following.

A Suspected Fungus.

F.T. (Charters Towers)—

The fungus you describe is probably *Lepiota dolichaula*, a tall, white mushroom sometimes attaining a large size. This species has been suspected at different times of causing losses among young stock both here and in New South Wales, and on this account we have always looked upon the plant with suspicion. There is no royal road enabling one to tell if a mushroom is poisonous or not; in some genera we know that all the species are dangerous, in others only some. Apart from these, the only way to find out is to cook and taste discreetly.

Crude Papain.

N.S.T. (Wooloowin)—

Your inquiry concerning a substance obtained from the papaw whilst green was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—"Crude papian is the dried milky juice of the papaw fruit. Green and half-ripe fruit are pricked with a fork-like instrument and the dried drops of juice are collected afterwards. This crude papain, if collected in a damp atmosphere, decomposes very quickly by becoming mildewy, and therefore the collection can only be made during very dry weather. Papain is made by a complicated chemical process from the crude papain, hence the high cost.

A Common Weed *(Polanisia viscosa)*—"Tick Weed."

J.L. (Townsville)—

1. *Polanisia viscosa*. A member of the Capa family (Capparidaceæ), sometimes called "The Yellow Spider Flower," a very common weed in Northern and Central Queensland. It stretches through North Queensland and the Northern Territory to Asia, and in India, that land of teeming millions, it is reported that—"The seeds are sold in the bazaars, where they are used by the natives in their curries. They are also used medicinally, powdered and mixed with sugar to expel intestinal worms, and externally as a rubefacient in the form of a poultice, bruised with vinegar, lime juice, or hot water, for the same purposes as a mustard plaster. The whole plant has a sharp taste not unlike mustard, and in some parts of India is known as 'wild mustard.' It is sometimes eaten boiled with red peppers and salt." We have never heard a local name applied to it.

2. This bore neither flowers nor seeds, and in the absence of such, identification is really only guess-work. I think it is *Achyranthes aspera*, sometimes known as "Tick Weed," on account of the seeds which are borne in long terminal spikes sticking to clothing, &c. It has a wide range through Queensland to Asia, and is not known to possess any poisonous properties. In India the plant is reputed medicinal, principally as an external application to bites, stings, and sores.

"Myrtle"—"Cannon Ball Tree"—Pandanus.

C.A. (Darwin, Northern Territory)—

1. *Mimusops Elengi* var. *parvifolia.* "Myrtle." The Australian plant is recorded as *Mimusops parvifolia* R.Br. in the "Flora Australiensis" and "Queensland Flora," but H. J. Lam, one of the Buitenzorg men who has recently monographed the Sapotaceæ of the East Indian region, reduces it, and we think rightly so, to a variety of the widely distributed *M. Elengi.*
2. *Carapa moluccensis.* Cannon Ball Tree. E. D. Merrill, lately Director of the Bureau of Science, has adopted the older generic name *Xylocarpus.* He distinguishes two species, *X. granatum,* that grows in the mangroves, and *X. moluccensis,* that grows on sandy foreshores, but we always have difficulty in separating the two as far as Australian and Papuan material goes.
3. *Pandanus* sp. Was very pleased to get these specimens. I thought at first it was *P. spiralis,* the species asked for, but it seems to me to show differences. I am sending leaves and a few drupes to Professor Martelli, Florence, for identification.

Central-Western Plants Identified.

J.E.T. (Longreach)—The specimens proved to be:—

1. *Solanum esuriale.* Wild Potato.
2. *Bassia quinquecuspis.* "Bindey-eye" or "Spiny Roly Poly."
3. *Trianthema decandra.* Hog Weed.
4. *Andrachne Decaisnei.* An annual Euphorbiaceous plant very plentiful in Central Queensland after the summer rains. Properties unknown.
5. *Phyllanthus* sp. Family Euphorbiaceæ. Specimen scarcely good enough to distinguish the species. The genus Phyllanthus is represented in Queensland by a number of species; many are common in western pastures, but none is known to possess any harmful properties.
6. *Mollugo Glinus.* A plant of the family Ficoideæ. It has a wide distribution over the tropical and sub-tropical regions of the world.
7. *Atriplex* sp., probably *Atriplex semibaccata.* Commonly known in Western Queensland as "Salt-weed."
8. *Kochia* sp., *Kochia brachyptera.* A "Cotton Bush."
9. We cannot place this satisfactorily. We should say it is evidently the young growth of a species of Bassia. Could you get specimens further advanced?
10. *Salsola Kali.* Roly Poly. This plant in one form or another is very widely distributed over the warmer regions of the globe. So far as I know, it has not been recorded as poisonous in any way. In its flowering stage stock, particularly horses, nip off the young shoots, and do well on them.
11. *Neptunia gracilis.* Yellow-flowered Sensitive Plant.

The Chenopodiaceæ are not generally regarded as harmful except that many of them cause bloat rather severely. However, you rule this out, also solanine poisoning, so I am afraid we can help you but little regarding the specimens sent. Our knowledge on these matters in anything like a definite way is very limited.

Bowenia Fern.

C.J.R. (Brisbane)—

The specimen from Rockhampton and popularly known as the "Bowenia Fern" is *Bowenia spectabilis.* It is not a true fern, but a plant of the "Cycad" or "Zamia" family. There are only two species of Bowenia known, and both are natives of Queensland—not being found elsewhere. One of these is a common plant in the North—Cairns, Atherton, and elsewhere; the other confined, so far as known, to the Byfield region, near Rockhampton. All plants of the "Zamia" family are regarded as poisonous to stock, but the poison is apparently destroyed by heat. In this way the natives used the seeds of some species ground into flour as food, and in Western Australia the pith of the stem of the common species is sometimes grated, boiled, and fed to pigs, calves, and poultry. The plants are very ornamental and make good pot or bush-house plants.

Lantana crocea.

INQUIRER (Brisbane)—

The dark flowering Lantana referred to as overrunning parts of North Queensland is *Lantana crocea*. It is known to produce a disease in cattle known in Queensland as "Pink-nose." Feeding tests have shown that the ordinary Lantana (*L. camara*) can also produce the disease, but the general opinion is that the dark flowering kind (*L. crocea*) is much more virulent.

Candle Nut.

A.C.H. (Caboolture)—

The specimen is the Candle Nut (*Aleurites moluccana*), a native of North Queensland, but with a wide distribution through Malaya, New Guniea, and the Islands of the Pacific. It is often planted in Southern Queensland as an ornamental tree, and is a rapid grower. The nut is sometimes eaten, but is rather a dangerous one, as at times is causes severe purging and gastric trouble.

Asthma Plant—Red Caustic Creeper.

V.C. (Gympie)—

The larger weed is *Euphorbia pilulifera*, the Asthma plant. The dried herb, used as a tea, in many cases gives great relief to persons suffering from asthma. The smaller weed is also a member of the genus Euphorbia, it is *Euphorbia prostrata*, the Red Caustic Creeper. The stems, when cut, exude a milky sap, which is sometimes applied to sores.

Western Plants Identified.

E.J.T. (Charleville)—

The package sent contained one specimen in leaf only of what we take to be Fuschia Bush (*Eremophila maculata*). It is probable this is the cause of the trouble. Many sheep men affirm that this plant is a wholesome fodder. We know very definitely, however, that the leaves contain a prussic-acid-yielding glucoside, and if eaten in quantity by sheep on an empty stomach might easily cause severe losses. The presence or absence of the glucoside and its amount apparently vary a good deal, and what controls the formation of the glucoside we do not know.

One specimen of *Portulaca oleracea*. Pig Weed. Causes bloat in hungry stock.

Two specimens of a small legume—only very young growth—I think *Neptunia gracilis*. Sensitive plant.

One specimen of *Rhynchosia minima*, a small legume, and a useful forage.

Three specimens of *Boerhaavia diffusa*, the Tar Vine. A useful forage herb.

One specimen of *Trichinium semilonatum*. Pink Heads. A useful forage herb.

One specimen of *Atriplex Muelleri*. Salt-bush. A useful forage.

Three specimens of some plant of the salt-bush or salt-weed family, too young to determine specifically. These are wholesome fodders, not known to be poisonous.

One specimen of *Commelina* sp. (Scurry Grass). Not known to be harmful in any way.

One specimen of very young growth only, but apparently not one of our known poisonous plants—I should say one of the Boraginaceæ or Convolvulaceæ. Not of any great consequence.

"Onion Couch."

R.G. (Maleny)—

We were pleased to receive the specimens of grass forwarded with you letter of 11th inst. as they confirmed a previous identification of "Onion Couch" (*Arrhenatherum avenaceum* var. *bulbosum*). This grass is very common in England and Europe and is naturalised in North America and other places. It is genrally looked upon as a rather useful grass in the mixed pasture, but stock do not relish it by itself or when old. It has the great disadvantage of being a pest in cultivation; its underground tubers or bulbils making it like "Nut Grass," "Johnson Grass," and similar plants very difficult of eradication. These records on the Blackall Range are the first of the grass in Queensland.

"Thorn Apple"—"Wild Tobacco."

J.C.G. (Mount Pelion, N.C.L.)—

The specimen with the prickly pod is *Datura stramonium*, commonly known as "Stramonium" or "Thorn Apple." It is a very widely distributed weed over the globe. In the United States it is known as "Jimson Weed"; all part of the plant, particularly the seeds, are poisonous. The weed is generally avoided by stock, but several cases have come under our notice where the plant has been harvested along with lucerne and other crops and the resultant chaff fed to horses with fatal results. It is quite a common weed in Queensland. The plant with the greenish-yellow berries and large leaves is a species of Solanum, either *Solanum verbascifolium* or *S. auriculatum*, but the specimens were black and rotten when they reached us. The former has white, the latter lavender or light purple flowers. Both species are very common weeds on scrub farms throughout coastal Queensland and are familiarly known as "Wild Tobacco." The plant belongs to a dangerous family, the Solanaceæ, but the berries are eaten by poultry and birds without ill effects following.

Poisonous Fungus.

C.N. (Buderim Mountain)—

Your specimens of fungi arrived in very bad condition. Fungi, as soon as they begin to die, are apparently attacked by certain flies the maggots of which soon reduce the fungus to a putrid mass. As far as we could make out, however, one of those sent seemed to be *Lepiota dolichaulos*, a large toadstool with white gills, stem, and a white cap flaked with brown. Little is known of this, but it has been suspected before of poisoning stock, as the following account from the "Agricultural Gazette of New South Wales" for December, 1902, will show:—

"*A Suspected Case of Fungus Poisoning.*—The following note on this case is published, as it is thought it might be of interest to stock owners, some of whom may have had similar cases which have not been brought under the notice of the Stock Branch. The cases occurred on Mr. M. H. Blaxland's farm on the Tweed River, and the Department is indebted to Mr. Blaxland for a full account of the symptoms. The first case occurred late in March, when a cow, after being affected for about ten days, died. No post-mortem examination was made. Ten days later there was a fall of rain, followed by a great crop of toadstools, and several cows became affected. Treatment with a purgative was successful in most cases, but two resisted treatment until removed to a paddock free from toadstools; they then rapidly recovered. The symptoms were general drowsiness, eye dull, belly tucked up, some evidence of abdominal pain (as shown by moaning and swishing of tails), rapid falling off in condition, slight constipation in most cases, but in one dysentery. The cattle were seen eating the toadstools, so precautions were token to destroy by trampling them down, when the cattle ceased to eat them. Since that time there have been no further cases. Specimens of the toadstool were submitted to Mr. Maiden, the Government Botanist, and Mr. Cheel, one of his assistants, reported it to be *Lepiota dolichaulus* (Berk and Br.), and stated that there was no previous record of its possessing poisonous properties. However, the evidence obtained against it in the present instance is such as to cause it to be regarded with considerable suspicion, but further information and opportunity to investigate fully are necessary to definitely determine the point."

Stink Grass *(Eragrostis major).*

F.M. (Tara, *viâ* Dalby)—

The grass is *Eragrostis major,* the Stink Grass. The local name arises from the fact that it gives off a strong odour—though perhaps not unpleasant—particularly after dew or rain. When young it is eaten freely by stock, but soon develops seed, matures, and becomes rather hard and unpalatable. It is an annual grass only observed to any extent during the summer months. It is mostly seen in cultivation paddocks, along railway lines, &c., though not, of course, confined to such places. On the whole it is not a grass of any particular value as a fodder.

PIG RAISING.

Following are selected replies from the correspondence of the Instructor in Pig Raising in the course of the month:—

Pig Raising and Dairying.

J.G. (Jambin, Rannes)—

There is no reason why pig raising should not be a payable proposition without having to depend upon dairying, but it requires more knowledge and attention to detail where milk is not included in the list of foods, for it is difficult to substitute any other food for milk unless resort is made to some purchased concentrated food like barley meal, pollard, or oat, wheat, or maize meal. In any case, one or two house cows would probably be kept, and in this case there should be some milk for the very young pigs. It is an advantage in the absence of milk to feed the sows more liberally at the age when the pigs are approaching weaning, and to allow the sow to suckle the pigs till they are up to ten weeks of age. The extra two or three weeks on the sow at this stage makes all the difference in the future growth of the young pigs.

It is necessary also to feed the young pigs more liberally at around six to ten weeks of age so that they do not suffer any check in growth at this stage. The foods to which you refer—pumpkins, sweet potatoes, green crops, and the like—together with grain maize, wheat, &c., all go to make up a good reliable list of foods.

You should, at this stage, also purchase one or two good text-books on pig raising and read the subject up extensively. There are several good books on the market. Pott's on the Pig, at about 12s. 6d., James Long on the Pig, at about 15s., Swine in America, by Coburn, at about 15s.

We would be pleased to select for you and to send on suitable books, on receipt of remittance, if you so desire.

Faulty Feeding.

W.D. (Woolooga)—

The trouble is due to faulty feeding. There is evidently far too much fluid in proportion to the solids being fed to both the sows and the young pigs. One occasionally notices farmers diluting skim milk with water to the extent of from 20 to 30 per cent. or more and still expecting good results. Young pigs particularly, require comparatively concentrated food with water available for drinking purposes at all times. Many young pigs suffer because they do not have any drinking water at all. It is suggested also, in the case of the pigs that are off colour, that the sweet potatoes should be boiled to a mash after being well washed to free them from soil. The skins may be left on the potatoes. To every ten parts of sweet potato fed to sow and young pigs add one part of pollard, barley meal, or maize meal. Also give each sow one tablespoonful or more of lime water in her feed every morning. Feed the pigs three times a day the amount of food they can eat up clean each time. Give green lucerne and succulent greenstuff. Try cleaning up the premises generally, liming the yards and pens, and white-washing the sties. Perhaps, as a preliminary in the case of badly-affected pigs, it would be helpful to give each young pig a dessertspoonful dose of castor oil in a small quantity of warm milk. Give the sow a bran mash to which 3 or 4 fluid oz. of castor oil has been added.

General Notes.

Broom Millet Board Election.

The Department of Agriculture and Stock announces that the following nominations have been received for election as members of the Broom Millet Board. The election will take place on the 16th May next:—Frederick H. V. Goodchild, Degilbo; William M. Hutchinson, Duleen; Hans Niemeyer, Hatton Vale; James Scanlan, Flagstone Creek; Erich M. Schneider, Binjour Plateau. Two members are to be appointed, and they will hold office for a term of one year, unless otherwise determined.

Arrowroot Board Election.

The counting of votes in connection with the annual election for the appointment of five growers' representatives on the Arrowroot Board took place at the Department of Agriculture and Stock, Brisbane, on Thursday afternoon, 14th April, with the following result:—

	Votes.
Alexander McG. Henderson (Redland Bay)	89
Alexander Clark (Pimpama)	82
Robert Stewart (Ormeau)	78
Johann F. W. Sultmann (Pimpama Island)	66
Benjamin G. Peachey (Ormeau)	65
William F. Oxenford (Oxenford)	64
John W. Latimer (Norwell)	61
Wilhelm A. Shipplock (Norwell)	61
Hans Grantz, junior (Norwell)	54

The first five persons will be appointed, and will hold office for a term of one year, unless otherwise determined.

Australian Canned Fruits Equal to World's Best.

At an exhibition of sample fruits arranged recently by the Department of Markets and Migration, the Minister (Mr. T. Paterson) said that Australian canned fruit was equal to the world's best. For purposes of comparison twenty tins of Californian fruit, purchased on the London market, were displayed side by side with corresponding samples of last year's Australian pack, and the result amply proved the Minister's contention. The Australian peaches were superior to the Californian in size, colour, and flavour, and the pears also were superior. It was emphasised, however, that the American pears had been subjected to much handling, and that much of the fruit was broken. The Australian apricots were equal to the Californian, and in some instances better.

"The display," said Mr. Paterson, "proved that the Australian canned fruit industry has profited by experience, and that to-day our product is unsurpassed. Proof of the quality of the Australian pack is shown in the attitude of the buyers in London. Our advices from the purchasers of the 1926 pack are to the effect that, when opened up, it was as good as the best Californian, but what is more to the point, London buyers are anxious to take our pack this year. Other buyers also, who previously would not take our fruit, are now keen to buy. We have progressed tremendously during the past three years, and now our product can hold its own with any other canned fruit in the world."

The Royal Society of Queensland.

The Annual Meeting of the Society was held in the Chemistry Lecture Theatre of the University at 8 p.m. on Monday, 4th April, 1927. The President, Dr. J. V. Duhig, M.B., was in the chair. The Annual Report and Financial Statement were adopted.

Officers elected for 1927 were—

President, Professor E. J. Goddard, B.A., D.Sc.; vice-presidents, Dr. J. V. Duhig, M.B. (*ex officio*), Professor T. Parnell, M.A.; hon. secretary, Mr. D. A. Herbert, M.Sc.; hon. treasurer, Mr. E. W. Bick; hon. auditor, Professor H. J. Priestley, M.A.; members of Council, Dr. W. H. Bryan, M.C., Professor R. W. Hawken, B.A., M.E., M.Inst. C.E., Dr. E. O. Marks, B.A., B.E., M.D., Professor H. C. Richards, D.Sc., and Mr. C. T. White, F.L.S. Professor Goddard was inducted to the position of president for 1927.

Mr. J. H. Smith, M.Sc., Dr. G. C. Taylor, M.B., Ch.M., and Misses L. Crawford, M. Fitzgerald, B.Sc., and G. Jones were proposed for ordinary membership. Mr. G. H. Barker was elected as an ordinary member.

The retiring President, Dr. J. V. Duhig, delivered his address, entitled "Nutrition." The foods of primitive and civilised man were compared and the effects on the human system outlined. The effect of different diets upon the teeth, the influence of light on nutrition, and the vitamin content of various foodstuffs were among the subjects discussed. Ideal diets for children and adults were suggested.

Staff Changes and Appointments.

Mr. R. M. Wallace, Inspector of Slaughter-houses, has been appointed Inspector of Stock, with headquarters at Kingaroy.

The following transfers of Inspectors of Stock have been approved:—W. Ford, from Cooyar to Boondooma; E. T. Lewin, from Kingaroy to Toowoomba; L. P. Doyle, from Kingaroy to Cooyar; R. Ferguson, from Winton to Beaudesert; R. J. T. Kidd, from Beaudesert to Mackay; S. J. Monaghan, from Mackay to Richmond; R. Pusey, from Richmond to Muttaburra; H. Coffey, from Muttaburra to Winton.

Messrs. F. Gillan and W. Richardson have been appointed millowners' representatives on the South Johnstone Local Sugar Cane Prices Board, vice Messrs. N. Fisher and A. L. McColl, resigned.

Mr. N. T. Anderson, of Biddeston, *viâ* Oakey, has been appointed Chairman of the Cheese Board in place of Mr. H. Keefer, who has resigned his position as Chairman of that Board.

The following gentlemen have been appointed Members of the Arrowroot Board as from the 15th April, 1927, to the 14th April, 1928:—A. McG. Henderson, Redland Bay; A. Clark, Pimpama; R. Stewart, Ormeau; J. F. W. Sultmann, Pimpama Island; B. G. Peachey, Ormeau; and L. R. Macgregor (Director of Marketing).

The following transfers of Inspectors under the Diseases in Plants Acts have been approved:—J. A. Stockdale, from Wallangarra to Stanthorpe; S. C. Todd, from Wallangarra to Nambour; C. G. Williams, from Nambour to Brisbane; H. St. J. Pratt, from Stanthorpe to Wallangarra; R. L. Prest, from Brisbane to Stanthorpe.

Mr. F. B. Rutledge, of Quilpie, has been appointed Government representative on the Adavale Dingo Board, *vice* Mr. H. C. Pegler, resigned. Mr. W. J. Clements has been elected member of the Clermont Dingo Board, *vice* Mr. R. C. Hutchinson, deceased.

Mr. H. Whitcomb has been appointed canegrowers' representative on the Racecourse Local Sugar Cane Prices Board, *vice* Mr. R. S. Stevens, resigned.

Mr. J. A. Stockdale, Inspector Diseases in Plants, Wallangarra, has been also appointed Inspector of Stock.

Mr. R. C. Lethbridge has been appointed Government representative on the Booringa Dingo Board, Mitchell, *vice* Mr. H. J. Hearn, resigned.

Mr. B. A. Webb, of Darr Creek, has been appointed an Acting Inspector of Stock, as has also the member of the Police Force stationed at Rathdowney, such appointments to take effect as from 1st April, 1927.

Mr. N. Annand has been appointed Millowners' Representative on the Gin Gin Local Sugar Cane Prices Board, *vice* Mr. J. Laurison, resigned.

Mr. J. C. Pryde has been appointed Temporary Inspector of Stock at Maryborough.

All Inspectors under the Diseases in Stock Act have been appointed officers under and for the purposes of the Animals and Birds Acts.

Constable P. T. W. Allen, of Ravenswood Junction, has been appointed Inspector of Slaughter-houses.

Mr. C. B. Buxton, Clerk of Petty Sessions, Mackay, has been appointed Chairman of the North Eton Local Sugar Cane Prices Board, *vice* Mr. M. Gallagher, Police Magistrate.

Mr. G. F. Dafforn has been appointed millowners' representative on the Tully Local Sugar Cane Prices Board, *vice* Mr. G. B. Blair.

Mr. E. R. Hollamby, Inspector of Slaughter-houses, has been attached to Rockhampton, and Mr. R. T. Cridland, at present at Rockhampton, will be attached to Mareeba.

Constable W. E. Martin, Officer in Charge Police, Cooyar, has been appointed also Inspector of Stock for such time as he remains at Cooyar.

Mr. J. M. Matheson, Inspector of Stock, Cloncurry, has been transferred to the South Burnett Cleansing Area, with headquarters at Kingaroy.

Mr. J. P. H. Clark, Inspector of Stock, East Haldon, has been transferred to Wandoan, and Mr. A. W. Noll, Inspector of Stock, Wandoan, will go to East Haldon.

Mr. E. J. Lorraine, Brisbane, has been appointed Inspector under and for the purposes of the Diseases in Plants Acts, as from the 4th March, 1927.

Messrs. W. E. Black, J. H. Dendle, W. F. Hough, A. K. Williams, and W. D. Wilson have been appointed Temporary Rangers under and for the purposes of the Animals and Birds Acts.

The District Inspector of Stock, Longreach, has been appointed Government representative on the Mitchell West Dingo Board.

Australia in America.

The Prime Minister's Office advises that from the 30th ultimo the address of the Commissioner for Australia in the United States of America will be Cunard Building, 25 Broadway, New York.

Citrus Levy Regulations.

The period during which the Citrus Levy Regulations under the Fruit Marketing Organisation Acts shall be in force has been extended from the 28th February, 1927, to the 29th February, 1928.

Broom Millet Board.

An Order in Council has been passed, authorising the Broom Millet Board to give security to the Commonwealth Bank necessary for the financial accommodation to be provided by that bank to the board.

Stock Gate at Spicer's Gap Closed.

An Order in Council has been made under the Diseases in Stock Act, providing that stock (with the exception of horses in actual work accompanied by a permit to travel) shall not cross to the Darling Downs through the gate on the main road at Spicer's Gap.

Stallion Registration.

Regulation 4 under the Stallions Registration Act, providing for the fee for registration and renewal of registration of a stallion has been amended. Previously the fee for registration of a stallion was 20s. and for renewal of registration 10s. The Regulation as amended now provides for a fee of 20s. both for registration and renewal of registration of a stallion.

Dairy Produce Act.

A further Regulation 3A has been approved under the Dairy Produce Act, and in consequence several minor alterations in the previous Regulations have also been approved. These Regulations provide for the certification of butter and cheese makers. At the present time testers and graders of dairy produce at factories are issued with certificates of competency under the Dairy Produce Act. The new Regulation provides for the issue of similar certificates of competency for those engaged in the making of butter or cheese.

Queensland Represented at the Cuban Sugar Conference.

Hon. W. Forgan Smith, Acting Premier and Minister for Agriculture, has informed the Press that Mr. Norman Bennett represented his department at the conference organised by the International Society of Sugar Cane Technologists, and held in Cuba in March last. The previous conference held by this society was in Honolulu, in 1924. The subjects discussed at the recent conference at Havana included insect pests of sugar-cane; diseases of the sugar-cane plant; sugar-cane varieties and related problems of seed selection and seedling propagation; protective quarantine measures; field practices such as cultivation, fertilisation, tillage, &c.; and the operation and chemical control of the cane sugar factory.

Mr. Bennett is one of the Department's Travelling Scholars, and is at present in America. He started on his tour of the sugar countries of the world early in 1924, and on his return to Queensland in 1928 will devote his services in the Department to technical matters in connection with the manufacture of sugar. Mr. Bennett has already visited Java, Glasgow, the United States of America, and the West Indies. He will be in Hawaii in November of this year. Other Travelling Scholars in connection with the sugar industry are Mr. A. F. Bell, who is specialising in plant pathology, and Mr. H. W. Kerr, who is specialising in soil matters.

Mackay Show.

The Pioneer Farmers and Graziers' Show Society will hold its Annual Show on 28th, 29th, and 30th June.

Fruit Marketing Regulations.

Regulations under the Fruit Marketing Organisation Act have been amended. The amendments are made mostly in Regulations dealing with the election of sectional group committees.

Farleigh-Homebush Sugar Mill.

The Farleigh-Homebush Sugar Mill Suppliers' Committee has, by Order in Council, been brought under the operation of "*The Primary Producers' Organisation and Marketing Act of* 1926."

Importation of Pigs Prohibited.

An Order in Council has been made prohibiting the introduction into Queensland of any infected or suspected swine or carcass or portion of carcass of infected or suspected swine from the States of New South Wales and Victoria, for a period of twelve months from the 21st April, 1927, the date of the Order.

Banana Weevil Borer.

By Regulation 127 under the Fruit Marketing Organisation Act, the Committee of Direction of Fruit Marketing has been authorised to offer a reward of £2,500 for an effective scheme of treatment for the control of the banana weevil borer. The Regulation provides for an investigation committee to inquire into schemes received, and also provides for conditions under which schemes may be offered.

Pure Seeds Districts.

By Order in Council, Pure Seeds Districts have been formed for the purposes of the Cotton Industry Acts. The following are the districts:—

District No. 1.—Upper Burnett Settlement, consisting of Counties of Yarroll and Rawbelle.

District No. 2.—Callide Valley, Counties of Raglan and Pelham.

District No. 3.—Boyne Valley, county of Clinton.

Custard Apple Levy.

The Committee of Direction of Fruit Marketing have, by Regulation under the Fruit Marketing Organisation Acts, been empowered to make a levy on all custard apples marketed for the year ending 31st December, 1927, such levy to be payable by the growers of the custard apples so marketed, and to be at the rate of one penny per half-bushel case of custard apples. All sums raised by the levy will be expended only in the interests of the custard apple section of the fruitgrowing industry, and the primary purpose for which the levy is being raised is to advertise custard apples in Sydney and Melbourne.

Sugar Levy.

The Acting Premier and Secretary for Agriculture (Hon. W. Forgan Smith) has gazetted his intention to levy an assessment, at the rate of one half-penny on every ton of sugar-cane raised at sugar-mills during the season 1927-28, for the purpose of providing funds for the administration of the Sugar Cane Prices Acts. At the same time he is making a levy, at the rate of one halfpenny on every ton of sugar received at mills during the same season, for the purpose of financing the Bureau of Sugar Experiment Stations.

These assessments are payable by the owner of the sugar-mill in the first instance, and are levied annually, the one for last year under the Regulation of Sugar Cane Prices Acts being one penny per ton against the halfpenny per ton to be levied this year.

The levy last year for the upkeep of the Bureau of Sugar Experiment Stations was one farthing per ton against the one halfpenny per ton this year. It will thus be seen that on the combined two levies there is a reduction of one farthing per ton.

The levy under the Sugar Experiment Stations Acts is for the purpose of maintaining the sugar and entomological stations established at Bundaberg, Mackay, Gordonvale, and South Johnstone, and for subsidising amounts raised for the destruction of sugar-cane grubs.

The assessment levy under the Regulation of Sugar Cane Prices Acts is absorbed in the administrative expenses of the Central Sugar Cane Prices Board, the salaries of the various cane testers at the different mills throughout the State, and in defraying the expenses of the Travelling Research Scholars who are now visiting the other sugar countries of the world with a view of their subsequently placing their knowledge at the service of the Queensland cane industry.

Co-operation.

Two fool jackasses—now get this dope—were tied together with a piece of rope. Said one to the other, "You come my way, while I take a nibble at this new mown hay." "I won't," said the other, "you come with me, for I, too, have some hay, you see." So they got nowhere; just pawed up dirt, and, oh, by golly, how that rope did hurt! Then they faced about, those stubborn mules, and said "We are just like human fools. Let's pull together. I'll go your way, then come with me, and we'll both eat hay!" Well, they ate their hay and liked it, too, and swore to be comrades good and true. As the sun went down they were heard to say, "Ah, this is the end of a perfect day."

Australia's Debt to Farrer.

A special appeal is being made in New South Wales by the Farrer Memorial Trust for funds to enable the trustees to maintain the trust's selected scholar. Referring to the appeal the Minister for Agriculture in the mother State said that apart from the excellent work which had been done by the trustees of the Farrer Memorial Fund to perpetuate Farrer's memory by financing young scholars to undertake research work into various avenues of wheat improvement, and a movement started in Victoria a few years ago which met with indifferent success, practically nothing had been done to mark Australia's debt to Farrer. An effort, he added, was being made by the trustees, apart from the training of the research scholars, to have a national memorial raised over Farrer's grave, which, happily, was situated within the Federal Territory at Canberra; also to have his original holding, the birthplace of his wheat improvement work, to be retained as a national reserve. The trustees already had approached the Federal authorities in these directions through the Federal Capital Commission, and there were hopeful prospects that success would be met with.

Dairy Cows Should Have Clean Drinking Water.

Although it is most desirable from many points of view that cows should have a plentiful supply of good clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not as important as bacterial flavours, for instance, which gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not.

Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders, which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking, and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken.

Early Soil Preparation for Fruit Trees.

If the land intended for new planting is in fit condition for ploughing and subsoiling, it is a good plan to have the work done as early as possible, as moisture is thereby conserved. The soil is also put in a condition in which it will absorb any rains that fall, and thus no hold-up will occur at planting time through the land being too dry.

Except where the subsoil is of such a nature that it is undesirable to encourage the roots to strike into it, the land should be ploughed and subsoiled to a depth of 15 or 18 inches. This is generally more easily and thoroughly done in two "lifts," one being a plough turning a furrow in the ordinary way, and the second being a subsoiler that loosens up the bottom before the next sod is turned on to it. In most soils it is not possible to keep this uniform, the ordinary subsoiler sinking almost to the beam in some places and rising in others, so that the total depth may vary from 12 to 18 inches.

If planting is being carried out during a dry season it is an advantage for the subsoiling to be completed some months beforehand, so that any rain that falls will be caught and stored. It is important that, after subsoiling, land be brought to a fine condition as deep as possible; for this reason a deep cross-ploughing is advocated. If for any reason the lower depths of the worked soil have not been brought to a fine tilth, a wider hole should be dug when planting, and care taken that it is only filled with fined soil. The roots of the young trees are then assured of a fine but firmed soil to extend into.

Trees for Shade and Shelter.

The stockowner should recognise the value of shade and shelter. A little rough hill on the property, covered with stunted gum trees, is worth more to the farmer as it stands for shelter purposes than the small amount of grass it would grow should he decide to have it rung. To settlers in naturally clear country, judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

America Looks to Australia for Guidance.

Thus an editorial in the Queensland "Grazier's Review":—

We are so often being told that Australia is miles behind the rest of the principal civilised nations in the marketing of its produce, and in other commercial avenues, and so many shining examples are continually being held before our eyes —particularly America—that it is a pleasant relief to be reminded that there is at least one department in which we hold undisputed sway, and one matter on which even America is not ashamed to seek our guidance and profit by our example. That is, of course, the handling and marketing of our wool. America—by which is meant the United States—is noted as a seeker after efficiency, and as having an uncanny nose for the best in everything, and the courage to go after it regardless of false pride. Thus it is that Mr. J. W. Walker, a research worker in the U.S. Department of Agriculture, has been assigned to make a twelve months' study of wool production and marketing in Australia and New Zealand. Delegates from the leading co-operative wool marketing associations, representing 38,000 American wool producers, met officials from the Department of Agriculture at Washington recently to develop a Government programme of research service and educational work. At the conference Mr. Walker told them that wool coming from Australia and South Africa threatened to dominate the American market, as being better graded and better suited to mill requirements. Our methods of production and marketing have earned for us the confidence of buyers all over the world. Considering our tremendous output, the multitudinous sources of supply, and the conditions under which it is often prepared, our clip is a marvel of meticulous care. Mr. Walker has emphatically come to the right place, and we should have much of interest to show him.

Cleansing Dairy Utensils.

There are two common methods of killing bacteria—one is by the use of germicides or disinfectants, and the other is by the use of heat in the form of boiling water or steam. Disinfectants cannot be safely used for treating dairy utensils except in special cases, and the boiling water treatment is the general method adopted.

The question of an effective boiling water supply on the farm has been rendered more difficult of late years on highly improved properties by reason of the shortage of wood. This has not yet reached an acute stage generally, and where it has steps can be taken to overcome it. Older dairying countries have had the same problem to face and have adopted modern water heaters—electric heaters (where cheap power has been available) and other methods. We have hardly reached that stage, but consideration might be given on certain farms to the installation of bricked-in coppers (where not already done) as an economical means of heating water for cleansing dairy utensils. The ordinary chip bath heater is a convenient method of using up cobs, waste paper, &c., but care must be exercised to see that the water is heated effectively. To effectively treat the utensils, the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and is left to stand at the wash-up bench for five or ten minutes after being removed from the fire quickly cools off to well below boiling point.

The most effective method is to place the separator parts and the smaller dairy utensils, after properly washing, in the vessel used for heating water (be it a copper, kerosene-tin, or whatever is used), while still on the fire, making sure that the water comes to the boil. After five minutes, remove utensils and hang up, or stand, in a clean atmosphere. They will dry thoroughly in a few minutes without resource to rags, and will be in a perfect condition for the next milking. Set-in coppers are very useful for this purpose, and are not only economical as to the wood supply, but are effective in wet weather.

It is, of course, necessary to treat the utensils as outlined *twice daily, i.e., after each milking.* Where the milking has been carried out in such a way so as to reduce bacterial contamination to a minimum, and where the separator parts and other utensils have been correctly treated as suggested, other things being equal, the cream coming from the separator will be in a sound condition from a bacteriological point of view, and will not be heavily contaminated. This being so, there is every likelihood of it remaining in a "choice" condition until it is delivered to the factory. Additional precautions may be taken to assure of this being done.

PUBLICATIONS RECEIVED.

"Farm Engineering."

Byron B. Robb, M.S.A., Prof. Rural Engineering, Cornell University, and Fred. G. Behrends, B.S., Prof. Rural Engineering, Cornell University. John Wiley and Sons, Inc., New York. Our copy from Chapman and Hall, Limited, London. Volume I. Price, 12s. 6d. net.

In this volume there has been gathered knowledge of certain mechanical jobs which a farmer should know how to do. These include many smaller or shorter jobs, such as harness repairing, soldering, rope work, and belt lacing, as well as certain larger jobs requiring a greater degree of judgment and managerial skill, such as concrete work, leveling, and drainage, and the installation of water supply and sewerage disposal systems. Throughout this book the authors have attempted to teach the practice before stating the principles upon which it is based, rather than to teach abstract principles before any practice is given.

"Crop Production and Soil Management."

Joseph F. Cox, B.S.A., Prof. Farm Crops, Michigan Agric. College, and Michigan Experimental Station. Same publishers. Our copy from Chapman and Hall, Limited, London. Price, 13s. 6d. net.

This volume is intended as a handbook for students, whether they are enrolled in a vocational school or at work on the farm. Special emphasis is made by the author on the methods employed by the more successful farmers, and he points out that practices developed on the farm or contributed by scientific investigations, which are effective in reducing production costs, improving market quality of products, and placing the upkeep of soil fertility on a more permanent basis, are of great significance.

"Pasture Improvement in Australia."

Victor H. Green and others. Australian Fertilizers Pty Ltd., 19 Bligh street, Sydney.

This small, but very useful book is the first direct and comprehensive effort by a commercial house to supply information to stockowners on pasture improvement. When it is realised that a very big proportion of our wealth is derived from our pastures and natural grass lands, it becomes obvious that any work directed to increasing the quantity and improving the quality of our pastures is of national importance. It is altogether a valuable little book, well written and illustrated, and full of information to the stockowner that is not always so readily available. In it is embodied the experience of animal and pasture husbandry of practical men who have spent a lifetime on the land.

DEPARTMENT OF AGRICULTURE AND STOCK, QUEENSLAND,

PRICE LIST OF STUD BERKSHIRE PIGS FOR SALE

at

STATE FARM, WARREN, via ROCKHAMPTON, CENTRAL QUEENSLAND.

The undermentioned animals are available at Prices Quoted for the Current Month only:—

LIST No. 2 FOR MONTH OF MAY, 1927.

Farm No.	Description.	Sire.	Dam.	Date Farrowed.	Price.			Remarks.
					£	s.	d.	
1269	Berk Sow	Warren Monarch	W. Sadie	2-11-26	4	4	0	
1274	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4	4	0	
1275	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4	4	0	
1276	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4	4	0	
1277	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4	4	0	
1205	Berk Sow	Warren Premier	W. Perfection	27-8-26	5	5	0	
1206	Berk Sow	Warren Premier	W. Perfection	27-8-26	5	5	0	
1194	Berk Sow	Warren Monarch	W. Elsie	10-8-26	6	6	0	
1163	Berk Sow	Wilmot Ron	W. Pansy	6-5-26	7	7	0	

The above quotations are for pigs crated on rails Warren Station.

When placing orders full forwarding instructions should be furnished, together with Remittance, with Exchange added.

Further particulars may be obtained upon application to the Manager, State Farm, Warren, *via* Rockhampton.

Farm and Garden Notes for June.

Field.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sandpit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Kitchen Garden.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

Flower Garden.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, freesias, snowflakes, ixias, watsonias, iris, narcissus, daffodils, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States, if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash, or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder, and if the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay, or similar material. The plantation should be kept well

worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons, an adequate supply of water is essential, as the plants soon suffer from dry weather, or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt Area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt Area, which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1927.	MAY.		JUNE.		MOONRISE. MAY.	JUNE.
Date	Rises.	Sets.	Rises.	Sets.	Rises	Rises.
					a.m.	p.m.
1	6.19	5.19	6.38	5.2	5 31	9.50
2	6 20	5 18	6 38	5.2	6.39	10 55
3	6 21	5 17	6.38	5.1	7.46	11.57
4	6 22	5 16	6 39	5.1	8 53	...
						a m.
5	6 22	5.16	6 39	5 1	9 55	1.0
6	6 23	5.15	6.39	5.1	10.54	2.1
7	6 23	5.15	6.40	5 1	11 47	3.2
					p.m.	
8	6.24	5.14	6.40	5.1	12 33	4.3
9	6.24	5.13	6 41	5.1	1.11	5 2
10	6 25	5.12	6 41	5 1	1 50	6 1
11	6 25	5.11	6.41	5.1	2 23	6.58
12	6 26	5.11	6.42	5.1	2 54	7.54
13	6 26	5.10	6.42	5.1	3.24	8 45
14	6 27	5.10	6.43	5.1	3.53	9.32
15	6 27	5.9	6.43	5.1	4 24	10.14
16	6 28	5.9	6.43	5.1	5.0	10.53
17	6 29	5 8	6.44	5.1	5.36	11.28
						p.m.
18	6 30	5.7	6.44	5 2	6.19	12.2
19	6 31	5.6	6 44	5.2	7 5	12.33
20	6.32	5 6	6 44	5.2	7 58	1.6
21	6.32	5.5	6.44	5.2	8.55	1.39
22	6 33	5 5	6.44	5.3	9 55	2.16
23	6.33	5 5	6 44	5.2	10.58	2.56
24	6.34	5.4	6.45	5.3	...	3.41
					a.m.	
25	6 34	5 4	6.45	5.3	12 19	4.30
26	6 35	5.3	6.45	5.4	1 5	5.29
27	6.35	5 3	6.45	5.4	2.9	6.31
28	6 36	5.3	6.45	5·4	3.14	7.38
29	6.36	5.2	6.45	5.5	4.19	8.45
30	6 37	5.2	6.45	5 5	5 25	9.50
31	6 38	5.2	...	...	6.32	...

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

1	May	● New Moon	10 39 p.m.
9	,,	☾ First Quarter	1 27 a.m.
17	,,	○ Full Moon	5 2 a.m.
24	,,	☽ Last Quarter	3 33 p.m.
31	,,	● New Moon	7 5 a.m.

The unusual occurrence of two new Moons in this month is somewhat remarkable.

The conjunction of Venus and the Moon on the 4th should be looked for in the western sky about the time of sunset. Venus will be three degrees, or half the length of the Southern Cross to the northward of the crescent-shaped Moon. As the twilight deepens they will appear to more advantage, being still a good height above the horizon, over which they will disappear soon after 7:30 p.m. Mars, still fairly high up in the sky will then be the most brilliant object in the west.

Mercury will be in superior conjunction with the Sun on the 20th, when it will be on the far side of its orbit and in a line only just below the northern edge of the Sun's disk. Six months later Mercury will be in front of the Sun and a transit across its face will occur.

Saturn will be in opposition to the Sun on the 26th, that is it will be on the opposite side of the sky, rising very nearly as the Sun sets, and at its highest point at midnight and setting almost at the time of sunrise. Thus it will be above the horizon all night and be a favourite object for telescopic observation. The ring-shaped system, though not quite at its best, will be wide and very well displayed.

There will be an occultation of Epsilon Leonis, the stars at the point of the sickle in the constellation of the Lion on the 9th, commencing about 8.45 p.m. and ending about 9.45 p.m. near the latitude of Brisbane.

Saturn will be occulted by the full moon about thirty-six minutes after midnight on the 17th in Southernmost Queensland, this will be an interesting sight with or without binoculars.

7	June	☾ First Quarter	5 48 p.m.
15	,,	○ Full Moon	6 19 p.m.
22	,,	☽ Last Quarter	8 29 p.m.
29	,,	● New Moon	4 32 p.m.

The greatest astronomical event of this month will be the total Eclipse of the Sun on the 29th observable across the narrowest part of England, Scandinavia, etc., but not in Australia. The previous total Eclipse of the Sun in England was in 1724, and the next will be in 1999.

A fortnight earlier an interesting total Eclipse of the Moon will occur—eighteen minutes before the moon rises at Warwick it will enter the Umbra or the darkest part of the earth's shadow. An hour and a half later it will be totally emersed and a total Eclipse will occur. Instead of the usually bright, full-orbed Moon it will most probably have a darkened, copper-coloured appearance.

The occultation of Iota Leonis on the 7th about 8.30 p.m. will be observable in Southern Queensland. It will be at out 50 degrees above the horizon in the north-west, and in a favourable position for observation.